Adobe® Flash® Media Server 3.5

The next generation of Adobe's award-winning software for streaming video and real-time communication

Table of contents

1 Introduction
2 What's new in Flash Media Server 3.5?
3 The Adobe Flash Media Server 3.5 family
5 Flash Media Server quick comparison
6 Flash Media Server system requirements
7 Flash Media Server upgrades
8 Flash Media Server support for different versions of Adobe Flash Player
9 How Flash Media Server 3.5 works
11 Extending Flash Media Server
11 Benefits of streaming versus HTTP delivery
13 Streaming delivery
16 Feature summary of Flash Media Server 3.5
22 Security features
24 HD video quality features
27 Live video features
28 Mobile delivery features
29 Programming features
31 Deploying Flash Media Server 3.5
31 Verifying installation
35 Configuring performance features
41 Configuring security features
43 Configuring general settings
45 Using server tools
46 Scaling Flash Media Server 3.5
50 Using live video
52 Securing content with Flash Media Server 3.5
55 Stream encryption
57 Glossary
58 Online resources
59 Flash Media Server community
59 References
59 About the author

The Adobe Flash Media family of products has become the industry-leading solution for streaming video and real-time communication. The ubiquity of the Adobe Flash platform provides a rich viewing experience across all operating systems. With the release of Flash Media Server 3.5 software, customers benefit further from new features such as Dynamic Streaming, HTTP delivery support, DVR functionality and H.264 enhancements.

This white paper describes the powerful features of Flash Media Server 3.5, with special attention to the functionality and performance improvements in this version. You will learn about the software's scalability and the benefits of streaming, and gain the knowledge you need to make informed choices about how to deliver and monetize video and communication services to the largest online audience.

Introduction

The Adobe Flash Media Server family of products provides the rich media delivery platform of choice that reaches more people, more securely and efficiently, than any other technology. From user-generated content to movies and television shows to corporate training, Adobe Flash Media Server offers enterprise-level solutions to deliver content and communications. Flash Media Server can help you deliver breakthrough, engaging environments supported by enhanced multi way communications, DVR functionality, secure HD-quality video, integrated live video streams, delivery to mobile and devices, plus deeper interactivity through an extensible development architecture. Benefits include:

Superior user experience

- Faster video playback
- Live video support

Quality

- Streaming and recording support for On2 VP6 and H.264/AAC video codecs
- Automatic bandwidth detection and new Dynamic Streaming capability

Ubiquity of delivery

- Cross-platform client support (Windows®, Mac, and Linux®)
- New built-in HTTP server with the capability to serve all application assets from a single server, and roll back to progressive delivery when needed
- Adobe Flash Player available regardless of platform—with millions of downloads every day and penetration on 99% of personal computers worldwide
- Windows or Linux server distributions, now with support for more operating systems

Adobe

Interactivity

- Integrated video, audio, and data streaming for a complete social media toolset
- New DVR functionality that supports added playback features such as chapter navigation, time skip, interactivity, and other custom functionality
- Customizable server (using the server-side ActionScript® language and and plug-in architecture)

Security

- More secure content delivery with encryption and access control features and no client cache
- New support for encrypted H.264 streaming
- Improved SWF verification to ensure applications are authorized

Support for your business

- Better use of bandwidth
- Optimized deployment profiles to significantly reduce deployment costs
- Large and active Flash and Adobe Flex® developer community
- Ability to measure streaming delivery with customized logging
- Playback experience controlled by the content owner or distributor
- Customer's brand a priority

These benefits and more make Flash Media Server 3.5 your best choice for delivery of your branded content—whether it's live or video on demand. Adobe has created a server that is robust, efficient, and competitively priced. And with its expanded scalability options, it can easily grow as your business grows.

The ubiquity of the Adobe Flash platform across all screens—from desktop computers to other devices—is a powerful advantage. Flash Media Server allows you to stream video to web browsers via Flash Player, to the desktop on the Adobe AIR™ platform, or to mobile and other devices through Flash Lite™ 3 software. This ubiquity allows you to fully monetize your video, reaching the most people with the least hassle.

Unlike other video delivery technologies, which just present pre-branded players to your viewers, Flash Media Server 3.5 integrates with Adobe Flash Player and Adobe AIR, which allows you to create completely customized interfaces. Real-time data sharing, server-side plug-ins, logging, and monitoring application programming interfaces (APIs) provide developers and IT teams with the tools they need to develop and administer large-scale rich media applications.

What's new in Flash Media Server 3.5?

Adobe Flash Media Server 3.5 provides:

- High-quality video experiences for consumers
- Ubiquitous and secure platform for publishers
- Rich multiway application for advertisers
- Scalable enterprise streaming solution for IT professionals
- APIs to produce the next generation of multiway social media applications for developers

Adobe Flash Media Server 3.5 is a scalable, real-time media server that delivers high quality (up to HD level), on-demand, live audio and video content with great efficiency and superior quality of service to reach the largest possible audience, regardless of the platform. It can deliver prerecorded video, live video, playlists, music, video blogging, video messaging, multimedia chat environments, real-time datacasting, multiuser gaming, and more.

Flash Media Server communicates and streams to Flash Player, Adobe AIR, Flash Lite 3, and Adobe Media Player consistently across platforms and browsers.

Flash Media Server 3.5 has many improvements and new features, including:

- Compatibility with new Dynamic Streaming, an improved quality-of-service feature supported by Flash Player
- DVR functionality that allows for pausing and seeking within live video

- Integrated HTTP server to allow an all-in-one hosting solution for your interactive and streaming applications, defaulting to progressive delivery when needed
- Delivery of encrypted media, including H.264 support to Adobe AIR and Adobe Media Player
- New ActionScript classes for Dynamic Streaming
- Improved C++ plug-in samples
- Support for more platforms, including Windows 2008 and Linux Red Hat® 5.2
- Delivery of more streams and users per server with less CPU, lowering your streaming and infrastructure costs
- More efficient access to client statistics, using the Authorization plug-in
- Support for Adobe Extensible Metadata Platform (XMP) metadata-embedded video steaming
- Improved SWF verification, with support for validation from remote locations
- Support for server-side recording in MPEG-4 format
- New load simulator tool to test your network (available separately)
- Complete support for legacy Flash Media Server 2 and 3 applications
- Easier to deploy, with enhanced services, improved documentation, and preconfiguration

These improvements represent the continued evolution of Flash Media Server, giving developers much-needed tools for creating powerful rich media applications. In addition, the expanded support documentation, easier publishing points, and sample applications that ship with Flash Media Server 3.5 flatten the learning curve and speed production.

The Adobe Flash Media Server 3.5 family

There are three unique versions of Flash Media Server:

- Adobe Flash Media Development Server 3.5 (free from Adobe)
- Adobe Flash Media Streaming Server 3.5
- Adobe Flash Media Interactive Server 3.5

Flash Media Interactive Server 3.5 can operate as either an Origin or an Edge server to distribute traffic load. For more details on Origin and Edge configurations, see the "Scaling Flash Media Server 3.5" section.

Let's explore the features of each server to help you select the best solution for your specific application.

Adobe Flash Media Development Server 3.5

This free edition is available from *www.adobe.com*. It can be used in production for anyone who wants to implement basic low-volume streaming or social communication solutions. You can also use it for developing advanced streaming or social applications, because there is no functionality limit. You can even use it to leverage the multipoint publish feature, which allows you to create a live publishing point on your network, inject data messages into the stream, and then push the video to a larger content delivery network. This free server has a capacity limit of 10 simultaneous inbound connections. The number of outbound connections is limited only by your server bandwidth and processing power.

Adobe Flash Media Streaming Server 3.5

This server edition is ideal for one-way secure video streaming.

Flash Media Streaming Server 3.5 is an economical solution that allows you to quickly start streaming high-quality, more secure video. It provides all the features you need to stream video and audio, and works in unison with the Adobe Flash Media Live Encoder to stream live video. Core features include:

- Low-cost streaming to Flash Player, Adobe AIR, Adobe Media Player, and Flash Lite
- Easy to install and get started
- Multiple bit rate and bandwidth detection with Dynamic Streaming feature
- HD quality (with industry-standard H.264 video capabilities)
- Advanced tracking and reporting
- High capacity
- Network efficient
- Enhanced seeking
- Encrypted streaming
- Simple access control
- High-quality live video

Flash Media Streaming Server 3.5 ships with two services that make it easy to start streaming right out of the box:

- **Live video streaming**—The standard live video streaming application allows you to start publishing right away. It supports the Adobe Flash Media Live Encoder and the FLV Playback component (Flash 8 and later), and ships with a sample live stream subscriber SWF.
- **Video on demand (VOD)**—The standard VOD application features server-to-client bandwidth detection, domain-based authentication, full support for the FLVPlayback component (Flash 8 and later), and ships with sample FLV, SWF, and HTML files for playback.

The server-side code for the Flash Media services is fixed and cannot be modified. You can use the provided example media files for testing or upload your own and run multiple instances.

Both applications support the stream data access feature in Flash Media Server 3 and later, which allows you to access the bitmap data of a stream, and also works with the Flash Media Interactive Server edition. In the Flash Media Interactive Server edition, however, you can enhance the applications with custom functionality, record streams, utilize remote shared objects, and access additional scalability features. Refer to the Adobe Flash Media Services documentation for more information.

Adobe Flash Media Interactive Server 3.5

Adobe Flash Media Interactive Server 3.5 includes advanced streaming features such as:

- DVR functionality
- Edge server caching
- Access control APIs
- Redirection support (similar to HTTP 302 redirection)
- Plug-ins
- Custom video services
- Server-side video recording, including new support for H.264 format

- Multiway communication
- Social media solutions
- Distributed core processing
- Multipoint publishing
- Live-stream metadata injection

Flash Media Interactive Server also lets you include value-added multiway solutions to help you socialize your streaming media with advanced real-time communication and collaboration services. Flash Media Interactive Server is the only high-performance and scalable server on the market that supports multiway applications, including webcam video chat, recording, Voice over Internet Protocol (VoIP), and online games. Flash Media Interactive Server is the workhorse of the Flash Media family.

This server is ideal for:

- Large-scale deployment
- Developing custom video solutions
- Developing communication experiences
- Supplementing live or on-demand video streaming services with interactive features

Flash Media Interactive Server can also be used to interact with specialty data servers such as Lightweight Directory Access Protocol (LDAP) for authentication, Flash Remoting, Simple Object Access Protocol (SOAP), or XML, and integrates with Adobe Flash Media Live Encoder. For even more customization, you can also implement custom server-side ActionScript and develop plug-ins in C++ that further extend the functionality of the server.

Flash Media Server quick comparison

Features	Flash Media Interactive Server 3.5	Flash Media Streaming Server 3.5	Flash Media Development Server 3.5
• Dynamic Streaming • XMP metadata support • HD video support (H.264/AAC) • Real-time encrypted streaming • Robust logging • SWF verification • Live video streaming • Recorded video streaming • Network efficiencies • Maximized hardware capacity • Enhanced cache • 2GB file support • Built-in bandwidth detection • IPv6 support • Adobe Media Player support • Flash Lite 3 mobile support • Data keyframes • Stream data access	Supports all these features	Supports all these features	Supports all these features
Simultaneous connections	Unlimited	Unlimited	10

Features	Flash Media Interactive Server 3.5	Flash Media Streaming Server 3.5	Flash Media Development Server 3.5
Bandwidth limitations	Unlimited	Unlimited	Unlimited
Processor limit	8-way SMP (cores)	4-way SMP (cores)	8-way SMP (cores)
Flash Media Server services (live and VOD)	●	● (Not customizable)	●
Process scopes and distributed cores	●		
Core server processes	Unlimited	1	Unlimited
Archive (record) video on server	●		●
Custom server-side applications (server-side ActionScript)	●		●
Edge server configuration	●		●
C++ plug-in support	●		●
Server-side playlists (Internet TV)	●		●
Multipoint publish and redirect	●		●
Remote shared objects	●		●
AMF3 support	●		●
Server redirection	●		●
Plug-in architecture for LDAP authentication	●		●
Adobe Media Player tracking service	●		

Flash Media Server system requirements

Windows	Linux
Microsoft® Windows Server® 2003 with Service Pack 2 Microsoft Windows Server 2008 Microsoft Windows XP (Flash Media Development Server only)	Linux Red Hat 4 Linux Red Hat 5.2
Hardware requirements	
• 3.2GHz Intel® Pentium® 4 processor (dual Intel Xeon® or faster recommended) • 2GB of RAM (4GB RAM recommended) • 1GB Ethernet card	

For the most up-to-date requirements, see *www.adobe.com/go/learn_fms_sysreqs_en*.

Flash Media Server upgrades

Upgrading from Adobe Flash Media Server 3

The guidelines for upgrading from Flash Media Server 3 vary depending on your current license and when it was purchased:

- If you own Flash Media Interactive Server 3, you can purchase an upgrade to Flash Media Interactive Server 3.5.
- If you own Flash Media Streaming Server 3, you can purchase an upgrade to Flash Media Streaming Server 3.5 or Flash Media Interactive Server 3.5.
- Education licenses are not upgradable.

Upgrading from Macromedia® Flash Media Server 2

The guidelines for upgrading from Flash Media Server 2 vary depending on your current license and when it was purchased. To upgrade, you need your Flash Media Server 2 serial number.

- If you own any version of Flash Media Server 2 including Professional, Origin, or Edge, you can purchase an upgrade to Flash Media Interactive Server 3.5.
- Education licenses are not upgradable.
- Owners of Flash Communication Server 1.x (Personal and Professional editions) are not eligible for upgrade licenses for version 3.5.
- If you own Flash Media Server 2.0, you can upgrade to Flash Media Interactive Server 3.5, but upgrades to Flash Media Streaming Server 3.5 are not available.

Upgrading from Flash Media Streaming Server

You have two options for upgrading from Flash Media Streaming Server 3.0:

- You can purchase an upgrade to Flash Media Streaming Server 3.5.
- You can purchase an upgrade to Flash Media Interactive Server 3.5 to take advantage of its enhanced features.

Upgrading from Flash Media Streaming Server 3.5 to Flash Media Interactive Server 3.5 only requires the purchase of an upgrade serial number; the server software itself does not need to be altered.

Note: Installing the upgrade does not include the additional Flash Media Interactive Server documentation. You must acquire the documentation from Adobe with your upgrade purchase.

For a comparison of features in each edition, see the Flash Media Server quick comparison table on page 5.

Flash Media Server 3.5 Upgrade Plans

Flash Media Server 3.5 now has upgrade plans available that protect your investment for up to two years. Upgrade plans can help to ensure that you have the most recent version of Flash Media Server. Contact your Adobe Representative for pricing details and more information.

Flash Media Server support for different versions of Adobe Flash Player

Features	Version 6	Version 7	Version 8	Version 9	Version 9,0,115,0	Version 10
Sorenson Video codec (H.263): play and capture	●	●	●	●	●	●
On2 VP6 video codec: play only			●	●	●	●
H.264 and High Efficiency AAC: play only					●	●
RTMPE/RTMPTE					●	●
SWF verification					●	●
GPU hardware acceleration					●	●
Multicore support					●	●
Smart buffering					●	●
Dynamic Streaming						●
XMP metadata						●
RTMFP						●
Speex audio codec						●

Adobe AIR (version 1.0 or later)

Adobe AIR is a cross-operating system runtime that enables you to use your existing HTML, Ajax, Flex, or Flash web development skills and tools to build and deploy rich Internet applications (RIAs) to the desktop.

Adobe AIR applications support native desktop integration, including clipboard and drag-and-drop support, local file input/output, system notification, and more. Adobe AIR applications can connect to Flash Media Server to stream audio and video or share data, just as SWF files do.

Adobe Media Player (version 1.0 or later)

Adobe Media Player is a free standalone application built on the Adobe AIR platform that provides customized video delivery, branded channels, advanced usage tracking, and digital rights management support. Flash Media Interactive Server provides the mechanism that allows Adobe Media Player to stream media, and track and log client events and viewing history.

Adobe Flash Lite (version 3.0 or later)

Flash Media Server 3.5 can stream to devices that support the Flash Lite 3 mobile platform. This support opens up possibilities for interactive streaming to new markets, with powerful features:

- True FLV and MP3 streaming (On2 VP6-E, Sorenson Spark, MP3 codecs)
- ActionScript 2.0 API (NetConnection and NetStream)
- Device ID detection to allow optimization for specific devices
- Support for Real-Time Messaging Protocol (RTMP) tunneling

Flash Media Server 3.5 supports both prerecorded and live streaming. The same video experience available in the browser can now be delivered to mobile devices supporting Flash Lite 3.

How Flash Media Server 3.5 works

Flash Media Server solutions have both a server-side and a client-side architecture. The client experience is deployed as a SWF or AIR file, created in either Flash or Flex. Clients run within a web browser (Flash Player), mobile device (Flash Lite 3), or as a desktop application (Adobe AIR). A client could also be another Flash Media Server or Adobe ColdFusion® 8, Adobe Flash Media Live Encoder, or licensed third-party technology that can stream or communicate with Flash Media Server. The server manages client connections and security, reads and writes to the server's file system, and performs other tasks.

The client is the initiator of the connection to the server. When connected, the client can communicate with the server and with other connected clients. Clients connect to *instances* of applications; for example, a chat application may have many rooms. Each room is an instance of the chat application. Multiple instances of an application can be running simultaneously. Each application instance has its own unique name and provides unique resources to its connected clients.

Flash Media Server communication protocol (RTMP)

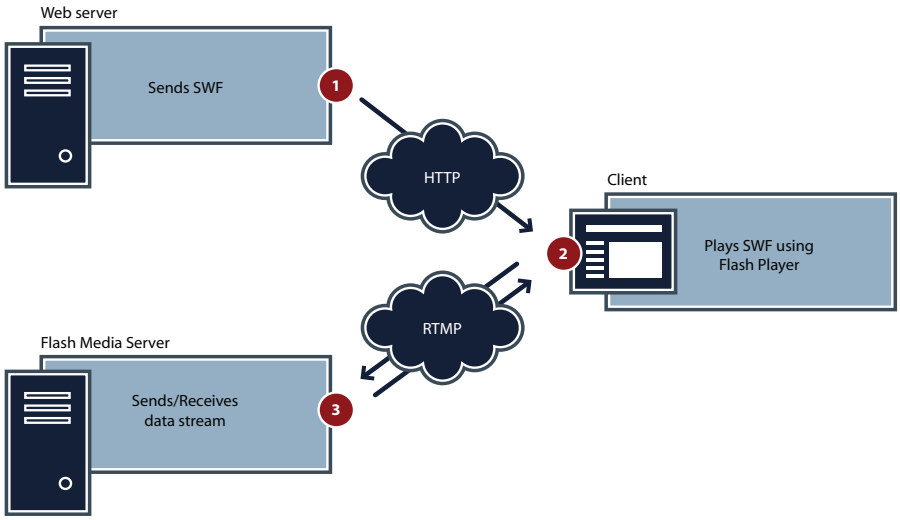
Flash Media Server communicates with its clients using the Adobe patented RTMP over Transmission Control Protocol (TCP), which manages a two-way connection, allowing the server to send and receive video, audio, and data between client and server. In Flash Media Server 3.5, you also have the option to use stronger stream security with encrypted RTMP (RTMPE). RTMPE is easy to deploy and faster than using Secure Socket Layer (SSL) for stream encryption. RTMPE is just one of the robust new security features in Flash Media Server 3.5.

There are five configurations of RTMP with Flash Media Server 3.5:

- **RTMP—**Standard, unencrypted RTMP. The default port is 1935. If a port is not specified, the client attempts to connect to ports in the following order: 1935, 443, and then via RTMPT on port 80. Port 1935 is a registered IANA port.
- **RTMPT—**RTMP "tunneled" over HTTP. The RTMP data is encapsulated as valid HTTP data. The default port is 80.
- **RTMPS—**RTMP sent over an SSL. SSL enables secure TCP/IP connections. Flash Media Server natively supports both incoming and outgoing SSL connections. The default port is 443.
- **RTMPE**—Enhanced and encrypted version of RTMP. RTMPE is faster than SSL, and does not require certificate management as SSL does. If you specify RTMPE without explicitly specifying a port, the Flash Player scans ports, just as it does with standard RTMP, in the following order: 1935, 443, 80, and 80 (RTMPTE) (supported with Flash Player 9,0,115,0 or later; Adobe AIR; and Adobe Media Player).
- **RTMPTE—**Encrypts the communication channel, tunneling over HTTP. The default port is 80 (supported with Flash Player 9,0,115,0 or later; Adobe AIR; and Adobe Media Player). The key benefits over SSL (RTMPS) are performance, ease of implementation, and limited impact on server capacity.

Utilizing the appropriate RTMP type, Flash Media Server can send streams through all but the most restrictive firewalls, and help protect rights-managed or sensitive content from piracy.

The following figure illustrates the basic architecture of a Flash Media Server connection.



Flash Media Server client/server architecture

Supported file types

Flash Media Server 3.5 is completely backward-compatible with Flash Player 6 or later, Adobe AIR, and Flash Lite 3 clients. Additional formats and features are supported with newer versions of Flash Player.

Flash Media Server 3.5 continues support for FLV and MP3 media, and AMF0 for data messaging. Flash Media Server 3.5, combined with Flash Player 9,0,115,0 or later, supports the industry-standard digital video format MPEG-4.

The file formats supported by Flash Media Server are listed in the following table. All formats are supported by Adobe AIR.

File format	Type	Container	Flash Player version	Usual pairing
Sorenson Spark	Video	FLV	6, 7, 8, 9, or later	Nellymoser/MP3
On2 VP6	Video	FLV	Flash Lite 3: 8, 9, or later	Nellymoser/MP4
H.264*	Video	MPEG-4: mp4; m4v; f4v†; 3GPP	9,0,115,0 or later	AAC+/MP3
Nellymoser	Audio	FLV	6 or later	Sorenson Spark/ On2 VP6
MP3	Audio	MP3	Flash Lite 3: 6 or later	Sorenson Spark/ On2 VP6
AAC+, HE AAC, AAC v1, or AAC v2	Audio	MPEG-4: mp4; m4a; f4v; 3GPP	9,0,115,0 or later	H.264
Speex	Audio	FLV	10 or later	Sorenson Spark/ Speex
AMF0	Data		Flash Lite 3: 6, 7, 8, 9, or later	
AMF3	Data		8, 9, or later	

*H.264 playback in Flash Player supports most popular profiles, including Base, Main, and High Profile (HiP).

†The f4v format is a subset of MPEG-4 ISO 14496-10 and AAC+ (ISO 14496-3).

Note: To use H.264/AAC in Flash without ActionScript, you need the updated FLVPlayback component, which is available as an update to Flash CS3 Professional software. This update is also required to use enhanced RTMP (RTMPE). Without the FLVPlayback component, developers can use ActionScript 1, 2, or 3 to create experiences with H.264. To use the new Dynamic Streaming feature, you need the updated FLVPlayback component, which is available with Flash CS4 Professional.

For more information on H.264/AAC support, see the Flash Player 9 Update FAQ at *http://labs.adobe.com/wiki/index.php/Flash_Player:9:Update:H.264*.

Extending Flash Media Server

There are a number of APIs available for developing custom applications and monitoring Flash Media Server.

Client-side ActionScript API

You can use any version of Adobe Flash (MX 2004 or later) or Adobe Flex Builder™ software to write client-side scripts that communicate with Flash Media Server (such as streaming or capturing live audio and video, or sending calls to server-side functions). These scripts can be any version of ActionScript.

Server-side ActionScript API

Flash Media Interactive Server provides access to server-side ActionScript. Server-side ActionScript code can be used to control login policies, republish content to other servers, allow and disallow user access to server resources, allow users to update and share information, and more. Server-side ActionScript is similar but not identical to ActionScript 1.0.

Plug-in API

Flash Media Interactive Server offers plug-ins written in C++ that allow you to extend the functionality of the server. Some plug-ins perform access security checks, allow geographical targeting of content, track statistical data about clients, and execute network-based file operations. Flash Media Server 3.5 ships with new sample plug-ins that make it even easier to get started.

Administration API

The Administration API gives you the tools you need to create Flash Player or Adobe AIR clients that can monitor and administer all editions of Flash Media Server.

Benefits of streaming versus HTTP delivery

There are three methods for delivering video over the Internet using Adobe Flash Player:

- Embedded video
- Progressive download
- Streaming

Embedded video is rarely used except in very specialized applications with low-quality, short video clips, so our discussion will focus on progressive download and streaming.

In both progressive and streaming delivery, the video content is external to the SWF file. To deploy video content to the web, the SWF file and the video file would be uploaded to a server.

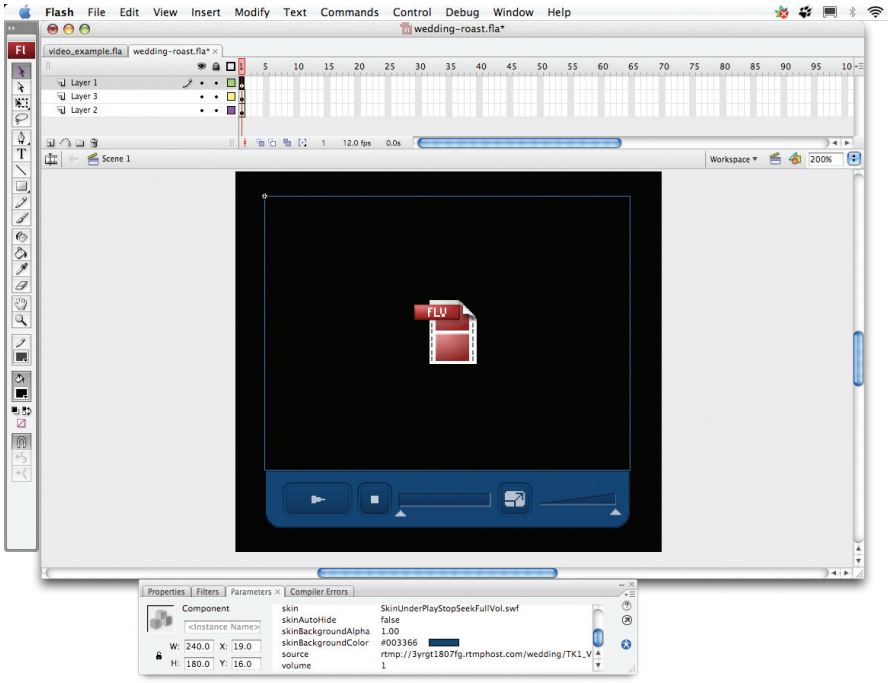
Keeping the video external and separate offers a number of benefits over the embedded video method, including:

- Easy to update—Accommodates dynamic content and it's relatively easy to add or change content independent of the video player and without the need to republish the SWF file.
- Small SWF file size—Your SWF file can remain very small for faster page loading, allowing the video to be delivered when the user requests it.
- Better performance—Because the FLV and SWF files are separate, the user has a better playback experience.

Note: Although this section focuses on the delivery of video files, these same methods can be used to deliver audio files.

Progressive download video delivery

Since Flash MX2004, progressive download has been supported for video delivery. This method allows developers to load external video files into a Flash or Flex interface and play them back during runtime. This can be accomplished using ActionScript commands with the Video object or playback components, or by setting parameters for the playback components in the authoring environment, as shown in the following figure.



Parameters set for an FLVPlayback component to stream an external video file into a SWF

When the video is played, the video file first begins to download to the user's hard drive, then playback starts. The video begins to play when enough of it has downloaded to the user's hard drive. The file is served from a standard web server through an HTTP request, just like a normal web page or any other downloadable document.

In comparison to streaming video, there's really only one consistent benefit to progressive download—you don't need a streaming server to deliver the video. Progressive download video can be served from any normal web server. While this can be convenient and potentially cost-effective, you should keep in mind that progressive downloads have limited seek and navigation capabilities, and users can access and repurpose your content. In some situations, such as playback behind very strict network firewalls, streaming delivery can be blocked. In these cases, rollback to progressive delivery can be desirable.

When to choose progressive download

Progressive download is a good choice for hobbyists or websites that have low traffic requirements, if they don't mind if their content is cached on a user's computer, they only need to deliver videos less than 10 minutes long, or their visitors cannot receive streaming video for some reason. You must stream your video if you need advanced features and control over video delivery, or if you need to display video to larger audiences (for example, several hundred simultaneous viewers), track and report usage or viewing statistics, or if you want to offer your viewers the best interactive playback experience. Streaming delivery also consumes less bandwidth than progressive delivery, because only the portion of the video that is watched is actually delivered.

Streaming delivery

The ability to stream video and audio was first available with Flash MX, Flash Player 6, and Flash Communication Server MX.

When you use streaming delivery, the video files are kept external to the other content, just like progressive downloads. Developers can use ActionScript commands (and parameter settings with media components) to load external video files into a SWF file and play them back at runtime. In fact, the ActionScript code needed for streaming is almost identical to that for progressive download.

However, in streaming video, each client opens a persistent connection to the streaming server, and the server streams the video bits to the client. Those bits are displayed by the viewer and then immediately discarded.

This tight connection between the server and the client, and the server's ability to precisely control and deliver any portion of a stream as requested, enables the developer to take advantage of some advanced capabilities, including:

- Determining the client bandwidth and serving a stream with an appropriate bit rate.
- Measuring and tracking the stream's quality of delivery and switching to a lower (or higher) bit rate stream if needed (for example, if network congestion increases).
- Automatically generating thumbnails or playing short previews of your video clip without having to create separate images or video clips, and without downloading the entire video in the background.
- Automatically creating "chapters" (with appropriate thumbnails) that can be used for navigation of longer videos, without having to break the video into smaller files.
- Seamlessly switching midstream from one camera angle or one stream to another.
- "Editing" video clips together to create one continuous video for playback. For example, you could play the first 10 seconds of clip 1, followed by the content between the 30- and 40-second marks of clip 2, followed by the last 20 seconds of clip 3.
- Creating webcast live events or recorded events where all viewers access the same content at the same time.

Why streaming is better

Progressive download is a simple method of video delivery with very little control—it's basically a simple HTTP download call. Streaming is a method that allows the publisher to control every aspect of the video experience.

The advantages of streaming video from Flash Media Server are numerous:

- **Fast start**—Streaming video is the fastest way to start playing any video on the web.
- **Advanced video control**—Features such as bandwidth detection, quality-of-service monitoring, automatic thumbnail creation, server-side playlists, and more.
- **Efficient use of network resources**—Customers who pay for their video hosting or bandwidth by the number of bits that are transferred can reduce their costs by using streaming video, because only the bits that the client actually views are transferred.
- **More secure, protected media delivery**—Because the media data is not saved to the client's cache when streamed, viewers can't retrieve the video or audio file from their temporary Internet file folder. Additional security features in Flash Media Server 3.5 also prevent stream ripping and other risks to your file's security. For more details, see the "Securing content with Flash Media Server 3.5" section.
- **Minimal use of client resources**—Resources such as memory and disk space are significantly reduced with streaming, because the clients do not need to download and store the entire file.

- **Tracking, reporting, and logging capabilities**—Because progressive download is a simple download of a file, you can't easily log specific relevant statistics such as how long the video was viewed, if the user navigated forward, backward, or paused the video, how many times the viewer played the video, if the viewer left the web page before the video completed playing, and so on. Streaming enables you to easily capture this important data.
- **Full seek and navigation**—Users can seek to any point in the video and have it start playing immediately from that point. This makes streaming a great solution for longer playing videos or applications such as video blogging, classroom lectures, and conference sessions, where you may want to jump into the video at a specific point rather than requiring the viewer to watch it from the beginning.
- **Deep interactivity**—The precise control found in streaming enables developers to create extensive interaction in their video applications. For example, the ability to switch camera angles, have one video spawn another video, or seamlessly switch to alternate endings are all enabled by streaming.
- **Live video**—Streaming provides the ability to deliver live video and audio from any connected webcam or DV camera, and even directly from some video cards, natively in Flash Player.
- **Video capture and record** (Flash Media Interactive Server only)—In addition to live streaming, Flash Media Server also gives you the ability to record video either in conjunction with the live stream (for example, archiving an event) or on its own (for example, video messaging).
- **Multiuser capabilities** (Flash Media Interactive Server only)—In addition to live one-to-many streaming, Flash Media Server also enables multiuser streaming of audio, video, and data for the creation of video communication applications.

While streaming may be perceived as being more difficult than progressive download, they're actually extremely similar—they both use the same components and the same ActionScript commands. Streaming just gives the developer more power to create rich, interactive video applications.

The only potential downside to streaming is that it requires special server software. Just as a robust data application requires you to install an application server in addition to your web server, robust media delivery applications require a streaming server in addition to the web server.

Customers who have high-volume streaming needs, popular content, or critical uptime requirements but don't want to build their own infrastructure can get the benefits of streaming video in Adobe Flash Player by utilizing a Flash Video Streaming Service (FVSS). These Adobe partners offer load-balanced, redundant deployment of Flash Media Server over a reliable content delivery network. For more information about FVSS partners, visit *www.adobe.com/go/fvss*.

When to choose streaming

You can use streaming with the Flash Media Server in situations where you need to:

- Deliver files longer than 30 seconds or larger than 100Kbps
- Perform bandwidth detection, allowing you to deliver the best quality video for the available hardware
- Monitor quality-of-service
- Perform real-time tracking
- Provide real-time data sharing and interactivity to your video experiences
- Stream live video and audio
- Record video and audio
- Serve more streams with less bandwidth

If your website or blog relies heavily on video, audio, or real-time data sharing, you can give your user the best experience by using the features in Flash Media Server.

Delivery comparison

The following table provides a comparison of the three video delivery techniques in Flash Media Server.

	Embedded video	Progressive download	Streaming delivery
Encoding	Video and audio is encoded on import into Flash using a Sorenson Spark or VP6-E codec. Alternately, FLV files (encoded elsewhere) can be imported and placed on the Flash Timeline (re-encoding is not necessary).	Video files are encoded in either the built-in or standalone version of Adobe Flash Media Live Encoder, through Flash Video Exporter and a third-party nonlinear editing or encoding product, or using a standalone video encoding application such as Sorenson Squeeze or On2 Flix.	Same as progressive delivery. In addition, you can capture and record live video feeds from client-side webcams or DV cameras, or using Adobe Flash Media Live Encoder, and control live encoding variables such as bit rate, frames per second, and video playback size programmatically.
File size	SWF files contain both the video and audio streams as well as the Flash interface, resulting in a single, substantially larger file size.	SWF and video files are stored separately, resulting in a smaller SWF file size.	Same as progressive delivery.
Start time	Large SWF files often require users to wait before the video starts playing, resulting in a negative user experience.	Starts relatively quickly, after enough of the video has downloaded to begin playback.	Immediate. The fastest way to go from initial load to actually playing the video.
Timeline access	When embedded in the Flash Timeline, video appears on individual frames and can be treated like any other object on the Stage.	Video is played back only at runtime. Individual frames are not visible on the Stage. Timeline events can be triggered at selected times during video playback using ActionScript.	Same as progressive delivery.
Publishing	Each time a Flash movie is published or tested, the entire video file is republished. Changes to video files require manually re-importing the files into the Timeline.	Video files are only referenced at runtime. Publishing to SWF files is much faster than embedded video. Video files can be updated or modified without recompiling the SWF file.	Same as progressive video. You can dynamically pull video files from virtual locations, such as your storage area network (SAN), a FVSS, or other content delivery network (CDN).
Frame rate	Video frame rate and SWF movie frame rate must be the same.	The video file can have a different frame rate than the SWF file.	Same as progressive delivery. Live video capture has programmable control over frame rate.
ActionScript access	Video playback and control is achieved by manipulating the movie's playback on the Timeline.	The NetStream class can be used to load, play, and pause external video files. Seek can also be performed on the portion of the video that has been downloaded.	Same as progressive delivery. Server-side ActionScript can also be used to provide additional functionality such as synchronization of streams, server-side playlists, smart delivery adjusted to client connection speed, and more.
Components	No video-specific components.	Media components (Flash 8 Professional and later) can be used to set up and display external video and audio files together with transport controls (play, pause, seek, and so on).	Same as progressive video. Also, you can use Flash Media Server communication components for streaming live and multiway video.
Seek and navigation ability	Requires the entire SWF file to be downloaded before the user can seek or navigate the video.	User can only seek to portions of the video that have been downloaded.	User can seek anywhere at any time.
Web delivery	Entire SWF file must be downloaded to the client and loaded into memory to play back video.	Video files are progressively downloaded, cached, and then played from the local disk. The entire video clip need not fit in memory.	Video files are streamed from Flash Media Server, displayed on the client's screen, and then discarded from memory in a play-as-you-go method.

	Embedded video	Progressive download	Streaming delivery
Performance	Audio and video sync is limited. Sync between audio and video suffer after approximately 120 seconds of video. Total file duration is limited to available RAM on the playback system.	Improved performance over embedded SWF video, with higher resolution and more reliable audio synchronization. Provides best image quality, which is limited only by the amount of available hard drive space on the playback system.	Improved efficiency from a web delivery perspective, with optimal bit rate delivery on an as-needed basis to as many customers as necessary.
Control over video stream	None	None	Full control over what gets delivered to the clients and when. Advanced access control via server-side ActionScript.
Support for live video	No	No	Yes
Compatibility	Flash Player 6 or later	Flash Player 7 or later	Flash Player 6 or later

Feature summary of Flash Media Server 3.5

The Adobe Flash Media Server 3.5 family offers significant new features that make it easy to stream video with more performance, protection, and security than ever before. The ubiquity of the Flash Player, powerful server-side and client-side APIs, and competitive pricing, make the Adobe Flash Media Server 3.5 family the obvious choice for both streaming video and robust interactive applications.

These are the key features and improvements to the Flash Media Server 3.5 family:

- **Performance**—Maximizes the capacity of your hardware and lowers deployment costs
- **Security**—Helps ensure the protection of your content
- **Quality**—Delivers the highest quality content, up to HD level, optimized for viewers' bandwidth
- **Live**—Provides maximum control and an instant start for high-quality live video
- **Mobile delivery**—Creates one version of content for delivery to mobile and other devices

Flash Media Server 3.5 performance

Flash Media Server 3 significantly increased how many streams can be delivered concurrently with a single server license. Delivering more streams requires fewer servers and lowers the cost of deployment. Linux deployments have improved by over 300%. Flash Media Server 3.5 continues the performance improvements seen in these Flash Media Server 3 benchmarks, with further optimization and streamlined performance.

Numerous features contribute to the increased performance. The features discussed in this section include:

- General performance optimization
- Connection throttling
- Enhanced process scopes
- Auto-close idle connections
- Enhanced RTMP (RTMPE)
- Built-in bandwidth detection, with support for Dynamic Streaming
- Process scopes
- Distributed cores

Factors affecting performance

This section explains how performance for Flash Media Server 3.5 is affected by different conditions. Measuring performance increases is done by comparing the number of concurrent streams for a given CPU utilization. Knowing how many streams a server can support helps you determine how many servers you need to deploy.

The number of streams a server can deliver is dependent upon a variety of conditions, including:

- **Protocol**—RTMP is the highest performing protocol, followed by RTMPE.
- **Video bit rate (quality)**—The lower the bit rate of your video, the more concurrent streams can be delivered by your server.
- **Platform**—You can deliver more connections with less CPU usage utilizing Linux Red Hat 4.
- **Hardware**—Hardware such as RAM, disk speed, CPU, and network speed influence the streaming capacity.
- **Configuration**—Flash Media Server 3.5 comes preconfigured for optimal streaming performance for most situations. Changing the configuration may improve your performance.
- **Application complexity**—If you deploy custom plug-ins or develop complex server-side application logic, your performance may increase or decrease.
- **Usage**—The way your users interact with your video impacts server performance. Interactions could include connecting, disconnecting, seeking, or pausing. This is discussed in more detail in the next section.

Flash Media Server 3.5 performance metrics

Flash Media Server 3 introduced over two times the performance on Windows deployments and over three times the performance on Linux. The following tables show the performance metrics for Flash Media Server in two scenarios:

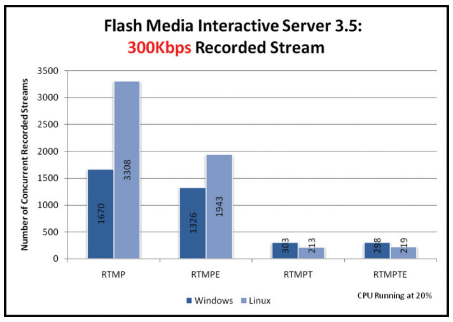
- **VOD**—Using prerecorded video
- **Live video**—Using live video streamed from Flash Media Live Encoder 2

Capacity numbers were calculated using the following hardware platforms. The numbers in this study were achieved with 2 X 1 Gbps network adaptors, but the results published are limited to 1Gbps throughput.

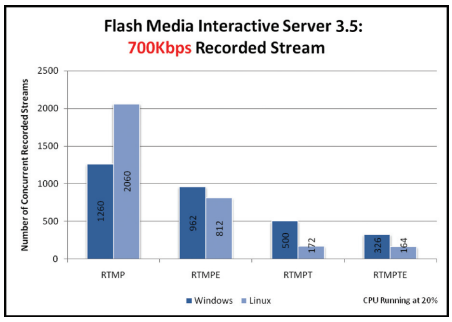
Server hardware	HP ProLiant DL360 G4p servers, with dual-core 3.6GHz, Xeon processors with hyperthreading Server configuration: 3.5GB of 200MHz DDR SDRAM, a SCSI2, 64GB RAID 0 disk storage at 10K RPM, and bonded/teamed 1GB Intel Pro 100 XF Ethernet cards at 133MHz
Operating systems	Windows Server 2003 with Service Pack 1; Linux Red Hat 4, kernel 2.6.9-22
Flash Player	Version 9,0,115,0
Test media	• 700Kbps: FLV, 117 minutes, 763MB using On2 VP6 codec • 300Kbps: FLV, 53 minutes, 105MB using On2 VP6 codec • 128Kbps: MP3; 52 minutes, 61MB using MP3 ID3v2.3 tag
Flash Media Server	Version 3: default configuration using default chunk size and cache

Video on demand

To provide a good comparison, the following graph shows the total number of streams achieved while using only 20% CPU. Linux was able to saturate a 1Gbps network adaptor with just over 20% CPU. The second graph illustrates the capability of each protocol with higher CPU usage.

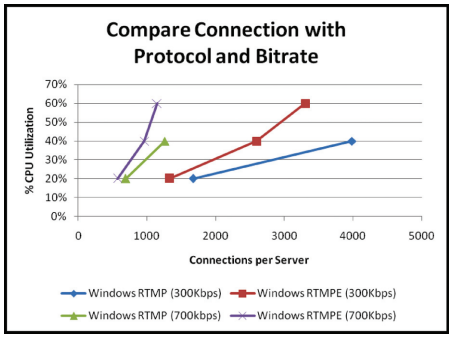


300Kbps recorded video limited to 1Gbps

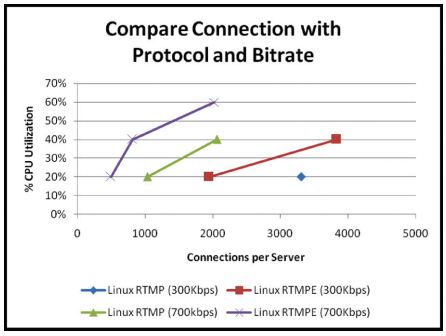


700Kbps recorded video limited to 1Gbps

The following graphs show the number of concurrent streams given different percent CPU utilization, protocol, and bit rate. Notice that with more percent CPU utilization, you can deliver more streams. The graphs were limited to 1Gbps and never reached 100% CPU. Higher data rates resulted in faster saturation, while lower data rates used more CPU to deliver similar connections.



Windows

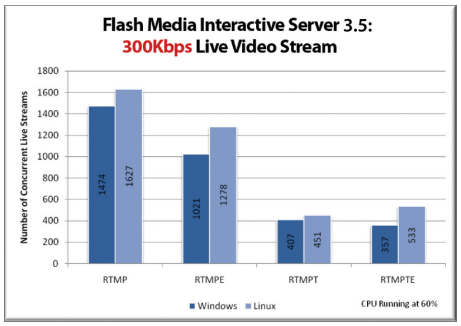


Linux

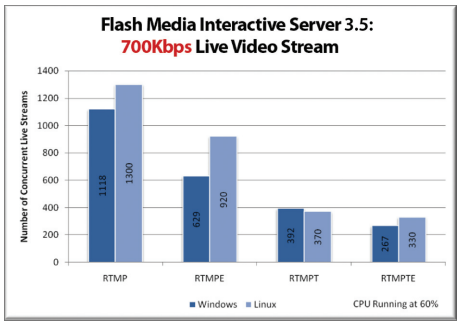
The impact of RTMPE reduced the capacity by only 25% to 30% on average, given similar percent CPU usage. If you are deploying RTMPE, you can expect increased CPU usage, but you can still saturate a 1Gbps network with less then 70% CPU.

Live video

Live video streaming from Flash Media Server is impacted by the same properties as prerecorded video streamed on demand. The following graphs show the total capacity achieved with live video. The tests were done with live video streamed from Flash Media Live Encoder 2 using On2 VP6 video and MP3 audio codecs.



300Kbps live video

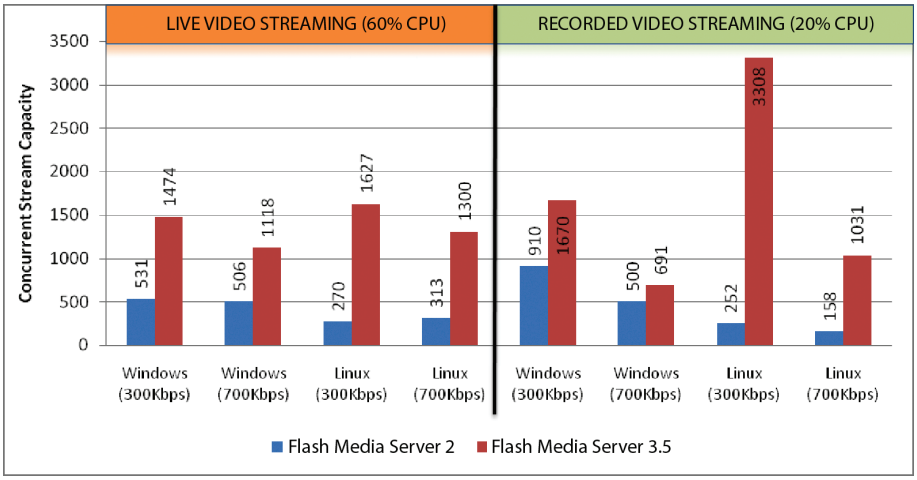


700Kbps live video

Comparing with Flash Media Server 2

Flash Media Server 3.5 nearly doubles the total number of active streams from Flash Media Server 2. Increases can be found in both live and prerecorded video applications and allow for significantly more connections at lower bit rates than Flash Media Server 2.

Total concurrent video stream capacity between Flash Media Server version 2 and version 3.5



All tests were sampled using RTMP. Values for live streaming were sampled at 60% CPU. Values for recorded on-demand streaming were sampled at 20% CPU.

Connection throttling

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

Flash Media Server 3.5 features connection-handling management that ensures high-quality service for users who are already connected to the server. In the past, if a large number of new users was trying to connect to a popular application, the current users could experience a disruption of playback. Connection throttling provides a number of methods to preserve quality of service:

- Restricts the number of threads that handle incoming connections.
- Provides a configurable maximum rate (per second) at which the server accepts new connections. Connections that exceed this maximum rate are delayed and queued in the operating system's network stack. The OS limits the number of connections it keeps in its queue. When the queue is full, clients attempting to connect are rejected. Note that this maximum rate is per "listener." For example, if your server is configured to listen on ports 1935 and 80, the connection rate applies to each port. So if the connection rate was set to 10 connections per second, that could potentially mean a total maximum connection rate of 20 per second.
- Provides a maximum queue length. Beyond this queue length, the server rejects connections to maintain quality of service for currently connected users.

These settings are, of course, fully configurable by the server administrator.

Enhanced process scopes

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

Flash Media Server 3.5 offers flexibility in configuring server process scopes. In Flash Media Server 2, a server administrator had three choices for process scope management: run a process for each virtual host, each application, or each instance. This could easily require a large number of processes. This new feature limits the number of processes to a predetermined number. The server then distributes the processes among all active virtual hosts. For example, if you choose to have 10 processes, and you have 20 active virtual hosts, they are distributed automatically over the 10 processes.

Auto-close idle connections

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

In version Flash Media Server 2 and earlier, the client controlled the connection between the client and the server. This meant that if the client disconnected unexpectedly, connections could be left open indefinitely. In Flash Media Server 3.5, the server can detect and close these long-standing idle connections. This idle time can be set in the `Server.xml` file, with a default disconnect time of 60 seconds.

Enhanced RTMP

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 9,0,115,0 or later.

RTMP is the patented protocol used by Flash Media Server to send and receive data. In Flash Media Server 3.5, RTMP is enhanced with performance improvements and increased security features.

RTMP in Flash Media Server 3 and later has been retooled to be more secure and more efficient. For security, the RTMP handshake between the Flash Player client and Flash Media Server is more strictly enforced. SWF verification is now possible, ensuring that the SWF connection request is coming from the expected source. This helps to prevent FLV and bandwidth theft.

In Flash Media Server 2 and earlier, utilizing an SSL was the only option to encrypt your stream data. However, this resulted in a noticeably slower connection. RTMPE in Flash Media Server 3 and later secures the channel with 128-bit encryption between the client and the server without the performance degradation of SSL, and without the need for a certificate.

Similar to the implementation of SSL (RTMPS), you'll only need to specify RTMPE in your client's connection string to utilize the protocol. For example:

```
nc.connect("rtmpe://www.example.com/myApplication")
```

RTMPE behaves exactly like RTMP, but is encrypted. Additionally, you can request an encrypted tunneling connection by specifying RTMPTE.

Dynamic Streaming

New feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 10 or later

Dynamic Streaming is a new quality of service monitoring feature that allows you to seamlessly switch between versions of a single video stream that are encoded at different bit rates. Dynamic Streaming allows your media application to smoothly adapt to clients with different capabilities, such as mobile devices with lower processing power and smaller screens, or clients with slower Internet connections, without interrupting the viewing experience. You can also use Dynamic Streaming to swap content in a playlist triggered by events you specify.

Built-in bandwidth detection

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

Bandwidth detection is built into Flash Media Server and is enabled by default. The updated approach to bandwidth detection, called native bandwidth detection, provides better performance and scalability than scripted bandwidth detection. To use native bandwidth detection, simply make sure bandwidth detection is enabled and write client code that calls functions built into Flash Media Server. This feature is compatible with ActionScript 2 and 3, and no server-side code is required.

You can also choose to disable native bandwidth detection and implement detection in a server-side script, especially if you want to reuse existing code. To use server-side bandwidth detection, use the specialized `main.asc` file Adobe provides for bandwidth detection and disable native bandwidth detection in the `Application.xml` file. For more information, refer to the *Adobe Flash Media Interactive Server 3.5 Developer Guide*.

Process scopes

Feature in Flash Media Interactive Server; requires Flash Player 6 or later.

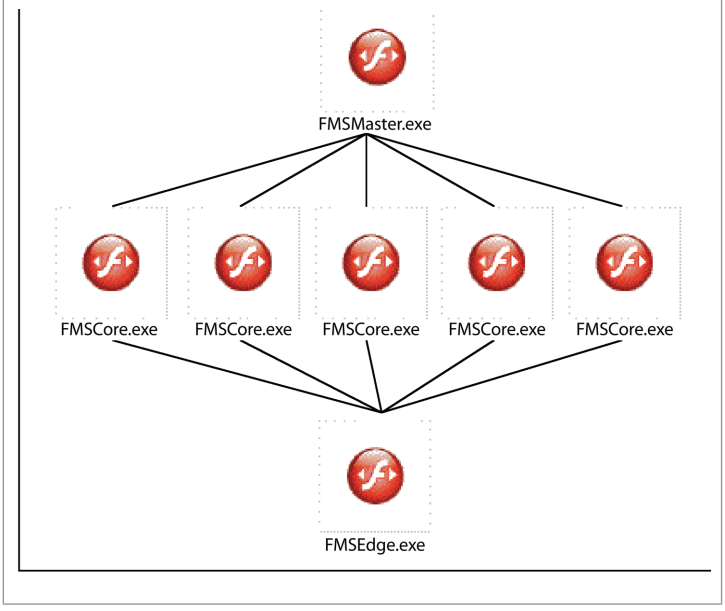
Flash Media Interactive Server 3.5 gives you control over how server processes are allocated. When you start the server, you are starting a process called `FMSMaster.exe` (Windows) or `fmsmaster` (Linux). Application instances run in processes called `FMSCore.exe` (Windows) or `fmscore` (Linux).

Flash Media Server operates with multiple processes. With the default installation, four processes are running: master, Edge, core, and admin.

The master process is a monitor that starts core processes when necessary. Only one master process can be running at a time, but many core processes can be running. You can configure how applications are assigned to server processes in the `Application.xml` file. You can specify the number of processes, the process scope, how long a process runs, and the number of process failures allowed before a core process is disabled.

Clients always connect through the Edge process (whether or not an Edge or Origin configuration exists). The master process is responsible for spawning and rolling over each core process. Clients never connect to the master process, and the master process cannot be configured. The following figure illustrates the master, core, and Edge processes.

Illustration of process scopes



Distributed cores

Feature in Flash Media Interactive Server; requires Flash Player 6 or later.

To further increase the capacity and reliability of your server, you can distribute connections across multiple processes for a specific scope. For example, if your scope was set to "adaptor," you could have connections spread across any number of core processes for each virtual host.

Like process scopes, the distributed core feature lets you increase the capacity of your server. Distributed cores let you engage more RAM for caching and more threading for the process-intensive connection routine. They cannot be used when deploying a multiway hybrid or live solution because connections need to be on the same core process to share communication.

Security features

Encrypted media support

New feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 10 or later.

Flash Media Server 3.5 now supports files that are protected through Flash Media Rights Management Server. You can leverage all the streaming and interactive features of Flash Media Server 3.5 to deliver signed and encrypted content, or even deliver via HTTP with the built-in HTTP server. For more information about Flash Media Rights Management Server, see *www.adobe.com/products/flashmediarightsmanagement*.

SWF verification

Enhanced in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 9,0,115,0 or later.

SWF verification in Flash Media Server 3.5 is a security feature that allows you to directly control which SWF files can connect to your server. Without implementing this feature, any SWF with the proper connection Uniform Resource Identifier (URI) and application name could freely connect, potentially accessing your streams and using server resources.

With SWF verification, you can configure the server to check that the SWF file attempting to access a certain application or application instance belongs to a group of preapproved SWF files. Enabling this feature is easy. You simply store a copy of the approved SWF file in the application directory and turn on the feature in the `Application.xml` file. When a SWF file connects to the server, the server verifies that the file exactly matches the SWF file in your application directory, and then accepts the connection.

To approve a SWF file for any instance of a certain application, you place it in the SWFs directory in that application's folder. To approve a SWF file for a specific instance, you place it in the SWFs directory inside that instance's folder. This feature has been enhanced in Flash Media Server 3.5 to allow verification of SWF files without requiring copies on the server computer. You can now use the File plug-in to retrieve SWF files that are stored in distributed locations.

Note: If you're deploying an Adobe AIR application, copy the SWF file that you compiled either into the Adobe AIR package or to the server to make it available for SWF verification, or use the File plug-in to point to its remote location.

Standardized server redirection handling

Enhanced feature in Flash Media Interactive Server; requires Flash Player 6 or later.

Flash Media Server 3.5 supports stream redirection in RTMP, which behaves much like HTTP 302 redirection. This feature can be enabled by using an access adaptor server-side plug-in or in server-side ActionScript. For example, while using an access adaptor running on an Edge server, you could use this redirect method to notify a client that a requested video does not exist in the expected location, and pass it a new URI for the stream. It could also be useful for other Flash Media Server load-balancing schemes as well as content organization.

A revised server-side and client-side API allows you to manage server redirection data. Note that you need to use the updated FLVPlayback component to take advantage of this feature. For more information, refer to the Flash Media Server 3.5 documentation, *Plug-in Developer Guide*.

Server-side plug-in architecture

Feature in Flash Media Interactive Server; requires Flash Player 6 or later.

Adobe Flash Media Interactive Server 3.5 supports plug-ins written in C++ that you can customize to extend the server's functionality. There are three plug-in classifications: File, Authorization, and Access.

Each of these plug-ins can be used as-is or customized to your specific needs. New sample or skeleton API examples are provided, which you can extend to meet your functional requirements. You can have more than one version of each plug-in. For more information, see the *Adobe Flash Media Server Plug-in API Reference*.

File plug-in

The File plug-in allows developers to write custom asynchronous functionality allowing complete control over where and how Flash Media Server reads content from any file system or service. The file system can be local or remote and over any protocol, such as HTTP or even FTP.

Asynchronous read and write was a major new enhancement to Flash Media Server 3 and later. Previous versions of Flash Media Server supported only synchronous access to a localized file system. Each request for a read operation on a file had to wait for the previous requests in the queue to be completed. The File plug-in builds on this new asynchronous access, making it easier to implement network-based and remote file I/O.

For example, you could retrieve files from a remote location over HTTP and serve them to clients via Flash Media Server. If you are about to read a file from the disk to stream, you can now read that file from any mapped location, rather than only from the streams folder of your current Flash Media Server application. This feature is only applicable to VOD content or SWF verification.

Authorization plug-in

The Authorization plug-in allows you to tightly control client access to server `NetConnection` and `NetStream` events. You can use this plug-in to perform tasks such as:

- Access client statistics from the server space (such as bytes in and bytes out) repeatedly without affecting server performance
- Authorize connections to the server
- Authorize publishing, playback, or seeking within a stream
- Map logical stream requests to physical stream requests
- Apply rights management policies to stream requests
- Disconnect clients from the server
- Deliver content to clients according to their geographic location, subscription level, time, and duration of a specific user's access to specific streams, and so on

For example, an application with different membership levels could use the Authorization plug-in to deliver a high-definition stream to a paid member, and a standard definition stream to a guest. You would intercept the client before they connect, determine their membership level, then filter the connection to point to the correct stream file. This plug-in could also be used for access monitoring, logging, or implementing other custom rights management schemes. Because these Authorization plug-ins can be chained, you can implement a sequence of actions to create a sophisticated access filter for your content. With enhanced client statistics optimizations, you can now create custom monitoring solutions in the C++ application layer using the authorization plug-in without affecting server performance.

Access plug-in

The Access plug-in gives developers another security tool. It provides an additional layer between client and server, intercepting connection requests and examining both the client and the server to determine how to handle the request. With the Access plug-in, you can perform tasks such as:

- Query a database of login data to authorize the connection. If accepted, you could update the database with information about the client and keep a record of the connection.
- Determine the current server load, and choose to accept, reject, or redirect the client.
- Set read and write access for files and folders on the server.
- Set access to audio and video bitmap data on streams.

Enhanced cache

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

Caching behavior is optimized, improving Flash Media Server memory management and server performance. The efficiency has been significantly improved in Flash Media Server 3 and later, and the server administrator now has the power to set a ceiling on the amount of RAM utilized by the cache.

In Flash Media Server 2, the cache settings allowed you to specify the number of files you wanted to cache in the cache folder. Each of these files had a predetermined number of segments available to write into. If the server was too busy, all of the segments were not used in each file. Now, the cache is based only on segments, not the number of files—resulting in much more efficient caching behavior.

IPv6 compliance

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

Required by many government customers, IPv6 is the next generation protocol replacing IPv4 (such as, 192.168.0.1). This new version expands addressing capabilities from 32 bits to 128 bits, and is supported in Flash Media Server 3.5. The Flash Media Server Administration Console will also be fully compatible with IPv6 addressing.

HD video quality features

Flash Media Server 3.5 has no limits on data rate or video quality. Flash Media Server 3.5 supports traditional FLV (using Sorenson Spark or On2 VP6/MP3 codecs) and MPEG-4 (using H.264/AAC+ codecs). Whether you need to stream 50Kbps media files to dial-up connections and mobile devices or up to 20Mbps for full HD quality—Flash Media Server can support your application.

Video profiles in Flash

The video profile you select affects the quality of your video. Flash technology is organized around three video profiles: Light (LT), Standard (SD), and High Definition (HD).

- Video LT—Mobile delivery via Flash Lite 3 (On2 VP6 codec only)
- Video SD—Standard-definition web video (On2 VP6 and H.264 codecs)
- Video HD—High-definition video (On2 VP6 and H.264)

Each profile is further organized into three levels, as shown in the following table.

Level	Codec	Target resolution/data rate
LT level 1	VP6 Mobile	GSM
LT level 2	VP6 Mobile	3G
LT level 3	VP6 Mobile	3G-high
SD level 1	On2 VP6 and H.264	160x112
SD level 2	On2 VP6 and H.264	320x240
SD level 3	On2 VP6 and H.264	640x480
HD level 1	On2 VP6 and H.264	640x480
HD level 2	On2 VP6 and H.264	1,280x720
HD level 3	On2 VP6 and H.264	1,920x1,080

(Source: *www.adobe.com/products/hdvideo/supported_technologies/h264.html*)

Typical frame rates range from 5 frames per second (fps) to 30 fps. Higher frame rates and screen resolutions require more computing power to play back. Flash Player 9 supports hardware-accelerated, full-screen video playback.

H.264 video codec

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 9,0,115,0 or later.

The H.264 codec delivers excellent quality video and is supported by Flash Media Server 3.5. The video streaming-related subsets of the MPEG-4 part 10 standard supported by Flash technologies are:

- Baseline—Widely used in videoconferencing and mobile applications running on devices with limited computing power.
- Main Profile (MP)—The original profile intended for broadcast and storage applications, MP has been largely overshadowed by High Profile.
- High Profile (HiP)—The primary profile for broadcast and disk storage applications. HiP is the profile adopted by both high-definition DVD formats: HD DVD and Blu-ray disc.
- High 10 Profile (Hi10P)—A profile that increases decoded picture precision of HiP to 10 bits per sample.

Flash Player 9 and later, supports streaming or progressive playback of MPEG-4 container formats such as MP4, M4A, MOV, MP4V, 3GP, and 3G2 if they contain H.264 video or HE-AAC audio.

For more information about H.264 implementation, visit *www.adobe.com/products/hdvideo/supported_technologies/h264.html*.

For full system requirements for rendering HD content in Flash player, visit *www.adobe.com/products/hdvideo/systemreqs.html*.

HE-AAC audio codec

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 9,0,115,0 or later.

Flash Media Server 3.5 supports streaming of HE-AAC audio. The codec profiles defined by the ISO/IEC 14496-3 (MPEG-4 part 3) standard are supported:

- **Advanced Audio Coding (AAC) Main—**Adds perceptual noise shaping to the MPEG-2 version of AAC, improving quality at lower bit rates. Can handle up to five channels plus one subwoofer channel (5.1) in a single audio object.
- **AAC Low Complexity (LC)—**Slightly less efficient than AAC Main and requires less CPU power to encode and decode. AAC LC is optimized for applications with low bit rates, such as streaming.

- **High Efficiency AAC v2 (also known as HE-AAC+, eAAC, and aacPlus v2)—**A superset of the AAC core codec that combines spectral band replication (SBR) and parametric stereo (PS) techniques to enhance coding , especially for low-bit-rate stereo signals. HE-AAC v2 supports up to 48 audio channels and enables 5.1 and 7.1 surround sound.

For more information about HE-AAC implementation, visit *www.adobe.com/products/hdvideo/supported_technologies/heaacv2.html*.

On2 VP6-S support

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 9,0,115,0 or later.

Flash Media Server 3.5 features streaming support for the new VP6-S codec profile available in Flash Player 9,0,115,0. VP6-S features greater simplicity in encoding and decoding of high-resolution, full-screen video, which allows high-definition video to be streamed and played back smoothly on mass-market computers with limited processor speeds. VP6-S is recommended for video delivered at or above 500Kbps at high resolutions when targeting these slower machines.

For more information on this codec, visit *www.on2.com*.

Dynamic Streaming

New feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 10 or later.

Dynamic Streaming is a new quality of service monitoring feature that allows you to detect any changes in your viewer's bandwidth and switch between streams during playback—ensuring a high-quality, uninterrupted stream. Dynamic Streaming uses standard H.264 and VP6 files, and is ActionScript-controlled, using new ActionScript methods available in Flash CS4 and Flash Player 10.

For example, if a reduction in client bandwidth is detected, the server can switch to a standard-definition stream at a lower bit rate. If network conditions improve, the server can switch back to HD video. The transitions occur seamlessly in the client. Although network conditions have changed, the video streaming to the client is uninterrupted.

For the optimal user experience, Dynamic Streaming requires the following:

- The different versions or pieces of content must be synchronized: the video timelines must match.
- Audio or other data in each content stream is synchronized with the video data in that stream.

The server transitions between two pieces of recorded content in three possible ways, depending on the type of content:

- Video-only streams—Transitions occur at the nearest keyframe in the target timeline.
- Video with audio streams—Transitions occur at the audio sample that immediately precedes the nearest keyframe in the timeline of the target stream. The audio timelines of the initial and target streams must match, or an audio artifact results.
- Audio-only streams—Transitions occur at the nearest possible sample.

Implementing transitions between live video content is slightly more complicated. The streams must have timestamps that are synchronized closely enough, within 3 to 5 milliseconds, so that the server can select accurate transition points.

Stream transitions occur on the server, but the command to switch streams and the logic to do so comes from the client application. The application developer includes ActionScript to monitor download and playback statistics and to switch from the old stream to the new stream when appropriate.

Adobe recommends that you use Dynamic Streaming for content that meets some or all of the following criteria:

- Video with long duration
- Video with large file size
- HD video
- Video with larger dimensions, such as full screen video
- Content distributed to users who are more susceptible to bandwidth issues, such as home users rather than corporate users

Smart buffering (player fix)

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 9,0,115,0 or later.

Flash Player 9,0,115,0 introduced an enhancement to the playback engine to sustain the buffer of a Flash Media Server stream when you pause playback of a recorded stream. This means that Flash Media Server no longer flushes the buffer when a video is paused. When resumed, playback is immediate and does not need to be rebuffered. This feature allows you to prebuffer video and create tight video switching among playlist items.

Live video features

Flash Media Server 3.5 gives you access to several powerful new features that enhance your live video publishing applications.

DVR functionality

Feature in Flash Media Interactive Server; requires Flash Player 10.

Flash Media Interactive Server 3.5 allows server-side recording of Spark or H.264 streams. These video files can then be played back, with added features such as pausing and seeking within the live video, and other custom functionality. This can be achieved through client-side and server-side ActionScript code.

Live instant-on

Feature in Flash Media Interactive Server and Flash Media Streaming Server; requires Flash Player 6 or later.

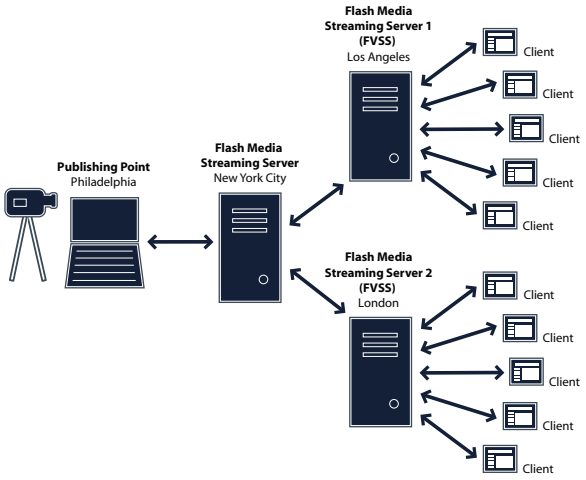
Video streaming through Flash Media Server starts playing instantly when a page is loaded or the play button is selected. This is a distinct benefit over other streaming technologies, as well as progressive delivery, and is compatible with both live and on-demand streams.

Multipoint publish

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

A powerful feature available in all editions of Flash Media Server 3.5, the multipoint publish feature gives flexibility and scalability to your streaming applications. Previously, if you were using a content delivery network (CDN) to deliver your streaming content, you were unable to implement any custom server-side code or inject any data messages into the outbound stream. Now, with multipoint publishing, you can use your own Flash Media Server (or Flash Media Live Encoder) to control the feed to the CDN, which then broadcasts it to your clients, as shown in the following figure. (The free development edition can actually be used in commercial applications as this local live publishing point.)

Multipoint publishing architecture



Stream data access

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 9,0,115,0 or later.

Stream data access allows you to control the ability to take a snapshot of a streaming video as a bitmap on a per-client basis. For example, you can create dynamic thumbnails and video previews of streaming content.

Stream data access can be configured in your server-side code. Similar to the `readAccess` and `writeAccess` properties, you can now set `audioSampleAccess` and `videoSampleAccess` on streams. Flash Media Server determines the permission setting for each stream and sends a special data message to the player. Because this feature uses bitmap data, it is only available with Flash Player 9 or later.

Data keyframes for live video

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

One of the challenges in live video broadcast is the need for current stream metadata to be sent to viewers who are connecting midstream. Unlike an on-demand stream, where metadata can always be at the beginning of the stream and received when a user first subscribes, live streams can be subscribed to at any time. Therefore, these latecomers may never receive the live stream's metadata. Data keyframes eliminate this issue by sending metadata to new subscribers when they join the stream.

Mobile delivery features

Flash Media Server 3.5 can stream video in FLV (On VP6/MP3) format to mobile devices with Flash Lite 3 installed. Flash Lite 3 has limited implementation of the `NetConnection` and `NetStream` classes, so it can only receive video, audio, and metadata packets.

When Flash Lite 3 connects with Flash Media Server, it sends user agent data. You can then use this information to filter access or to deliver video that is optimized for the device. The user agent string sent by Flash Lite 3 consists of:

- Software family and version—For example, Flash Lite, version 3.0
- Device identification—For example, a Motorola RAZR V3x mobile phone

- Profile identification—Resource Description Framework (RDF) URI reference for the device
- Network/type—For example, Code Division Multiple Access (CDMA), 3G, and so on

A user agent string might look something like this:

```
FlashLite/3.0.1 Device/RAZRV3x Profile/razrv3x Network/2.5G
```

You can find device information in the RDF reference. A sample URL for the Motorola Razor is *http://motorola.handango.com/phoneconfig/razrv3x/Profile/razrv3x.rdf.*

Flash Media Server can use this Flash Lite 3 information in numerous ways.

- Virtual keys—Virtual keys let you configure Flash Media Server without any programming to automatically access video from an alternate folder. Video in this folder could be optimized for the client. Previously, this was used to filter clients that could not support the On2 VP6 codec. Now it can be used for Flash Lite.
- Authorization plug-in—You can configure the Authorization plug-in to respond to the user agent by redirecting the request to an optimized video stream or to an alternate stream if it's not available.
- Server-side ActionScript—Using the client object on the server, you can access the user agent, parse it, and create simple access controls that manage which devices can access the video.

Programming features

Dynamic Streaming ActionScript classes

New feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

Flash Media Server 3.5 can receive commands to switch between versions of a single content stream that are encoded at different bit rates, allowing your media application to adapt to changing network conditions.

ActionScript 3.0 contains the `NetStream.info` property, `NetStreamInfo` object, and associated classes, which developers can use to monitor download and playback statistics. The `NetStream.play2()` method and the associated `NetStreamPlayOptions` class offer the ability to change to different streams in mid-play. (Similar APIs are available in ActionScript 2.0 as well.) For more information, see the *Flash Media Server ActionScript 3 Language Reference*.

Built-in services: Live and VOD

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

There are two built-in applications, or services, that ship with both Flash Media Streaming Server and Flash Media Interactive Server:

- **VOD—**The VOD service is a publishing point that lets you upload video and audio files to your server and start streaming them without having to build a custom service or configure the server in any way.
- **Live—**The live service is a publishing point that lets you use Flash Media Live Encoder to easily stream live video without any custom server-side code or configuration.

Using one of these built-in services is the simplest way to start streaming using Flash Media Server. These services are available in all Flash Media Server versions. Detailed, step-by-step instructions for using these applications are in the *Flash Media Server Installation Guide*.

AMF3 support

Feature in Flash Media Interactive Server; requires Flash Player 8 or later.

Flash Media Server supports the AMF3 format for sending data between the server and connected clients. Flash Media Server can now serialize and deserialize all basic datatypes, including Number, Boolean, String, Null, Undefined, Array, Date, XML, Object, and ByteArray.

Note: ByteArray data cannot be created or inspected using server-side scripting, but can be safely exchanged between clients.

This implementation is fully backward-compatible. Utilizing "blended mode" AMF support, both AMF3 and AMF0 clients can connect to an application simultaneously. If an AMF3 message is sent, however, the server disconnects all clients that support only AMF0 data. For example:

- If clients are either all AMF0 or all AMF3, they can communicate with each other regardless of the application's encoding.
- If two clients with different encodings connect to a "myAMF" application, as long as the data being communicated does not contain any new ActionScript 3 datatypes (for example, ByteArray or XML) or externalized AMF3 objects, both clients can communicate data to each other.
- If the AMF3 client decides to send a ByteArray, for example, the AMF0 client is disconnected because AMF0 clients do not understand ByteArrays. (When an AMF0 client is disconnected because of incompatible encoding, the event is logged in the server's log files.)

Whenever the server needs to serialize data for clients, it generally attempts to serialize data first in AMF0. If that is not possible, the server automatically serializes the data in AMF3. This support is available in all the basic communication methods `NetConnection.call`, `Client.call`, `application.broadcastMsg`, `SharedObjects`, and `NetStream.send` as well as in data embedded in video files. It's also important to note that a server-to-server `NetConnection` (through server-side ActionScript) defaults to AMF3.

In addition, default object encoding can be set in the `Application.xml` file. This can also be overridden for each individual `NetConnection` via the `NetConnection.object-Encoding` property. For example, `Application.xml` may say AMF3, but you can set a `NetConnection` to be AMF0 by setting this property, or vice versa.

AMF3 support gives Flash Media Server 3.5 a highly flexible tool for data sharing and opens up even richer possibilities for interactive applications—in many cases, eliminating the need to integrate with other back-end server technologies.

Administration API

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

You can use the Administration API to create custom tools to monitor, configure, and manage Flash Media Server 3.5. The Administration API methods can be called over HTTP via a web client, or via a Flash Player or Adobe AIR client over RTMP from any version of client-side ActionScript. You can use Administration methods to perform tasks such as adding or removing administration accounts, server configuration, garbage collection, virtual host administration, application and stream monitoring, and more.

For details about using the Administration API, see "Using the Administration API" in the *Adobe Flash Media Server Configuration and Administration Guide*. It is also described in detail in the *Adobe Flash Media Server Administration API Reference*.

Deploying Flash Media Server 3.5

Installing Flash Media Server 3.5 is a simple process, whether deploying to Linux or Windows platforms. Your first step is to design your deployment structure. Flash Media Server can consist of individual installations, a single publishing point connected with a CDN, or a more complex Edge/Origin architecture, if required. It is recommended that you consult the *Adobe Flash Media Server Technical Overview* to help you assess your needs and design your specific deployment.

Regardless of your deployment structure, you must run the installer on each computer on which you want to run Flash Media Server. After it is installed, you need to configure each server individually, designating Edge and Origin servers, and so on. For detailed installation instructions, refer to the *Adobe Flash Media Server Installation Guide*.

Upgrading from Flash Media Server 3

All your Flash Media Server 3 applications are fully compatible with Flash Media Server 3.5. Custom applications written for Flash Media Interactive Server, however, do not work with Flash Media Streaming Server.

Before you upgrade to Flash Media Server 3.5, be sure to back up your configuration files, license files, modules, and application folders.

If you have C++ plug-ins (also called adaptors) that you want to reuse, recompile them.

For more detailed upgrade instructions, refer to the *Adobe Flash Media Server Installation Guide*.

Upgrading from Flash Media Server 2

All your Macromedia Flash Media Server 2 and Macromedia Flash Communication Server applications are fully compatible with Flash Media Interactive Server 3.5, so upgrading is a smooth process. However, no upgrade is available from Flash Media Server 2 to Flash Media Streaming Server 3.5 because it is a new product. To upgrade to Flash Media Streaming Server, you must purchase a full license.

The target installation folder for Flash Media Server 3.5 is different from the Flash Media Server 2 installation folder. In Windows, the default folder is now `Program Files\Adobe\Flash Media Server 3.5`. In Linux, the default folder is now `/opt/adobe/fms`.

Configuration files from Flash Media Server 2 are *not* compatible. Make sure to back up all your configuration files before upgrading. You must transfer your configuration manually to the new server. Server-side ActionScript and client-side ActionScript are fully compatible with Flash Media Server 3.5.

Flash Media Server 2 components for Flash will continue to be supported with the next version, but the components have been discontinued and will not be updated in future versions.

The Flash Media Server 2 Management Console has been renamed Flash Media Administration Console. It has not changed significantly; the debug does support H.264 playback.

For more detailed upgrade instructions, refer to the *Adobe Flash Media Server Installation Guide*.

Verifying installation

After installing Flash Media Server on your server, confirm that it was installed correctly. First connect to the server using the Administration Console.

`Start > Programs > Adobe > Flash Media Server > Administration Console` (Windows)

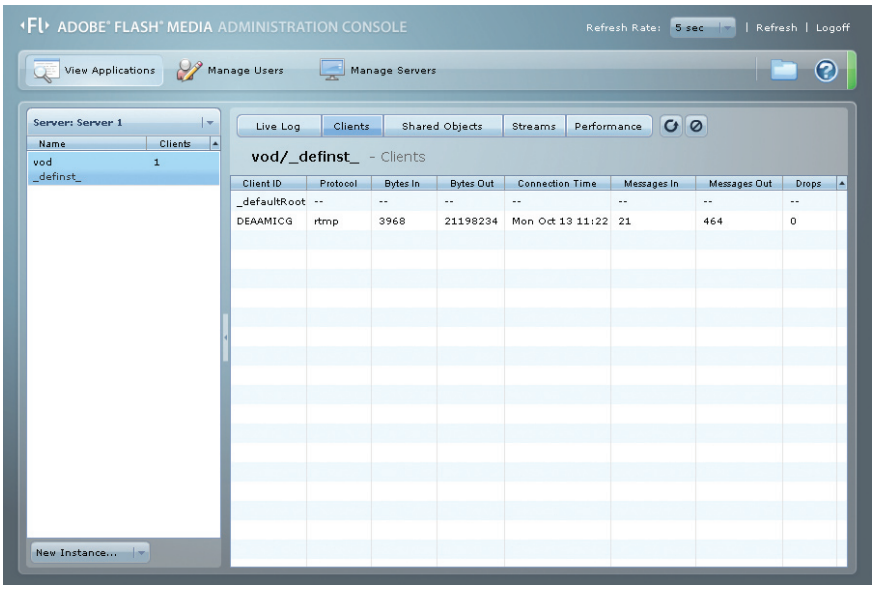
`opt/adobe/fms/fms _ adminConsole.htm` (Linux)

The console can help you verify which applications can run. Try starting the VOD or live applications. After logging in, click Video Applications, then click New Instance and select VOD or Live. If your server is working, you should see them start in the panel, as shown in the following figure.

You can also test your installation by running the vod sample application located in `samples/applications/vod/vodtest.html`. You can select a video (FLV or H.264) to play.

The *Adobe Flash Media Server Installation Guide* also provides a list of installed files and their locations. If you are having trouble getting Flash Media Server to run, you may want to consult this list to be sure your installation was complete.

Flash Media Server Administration Console



Integrated Apache HTTP Server

New Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

All editions of Flash Media Server 3.5 include a custom version of Apache HTTP Server. If you install and enable Apache, you can deliver client SWF files, container HTML files, and all media assets from the same server.

Additionally, you can write client-side ActionScript that causes Apache to serve media assets over HTTP progressive download if RTMP streaming fails. For example, if a client attempts to stream a video over RTMP and fails, the server attempts to tunnel RTMP over HTTP. If that attempt fails, the server delivers the video over HTTP.

If you are installing Apache, choose from the following options:

- Install Apache but leave it disabled. (This is the default installation setting.)
- Install Apache and enable HTTP delivery.
- Install only the configuration files and samples.

If you want to use your own Apache HTTP Server, either do not install Apache or install only the configuration files and sample.

Flash Media Server starts and stops the web server automatically. If you are proficient at working with Apache, you can disable this functionality in the `fms.ini` or `Server.xml` file and manage it on your own. If you start and stop Apache manually, or set up Apache as a service, start Apache Flash Media Server and stop Apache after Flash Media Server.

For more details, see the *Flash Media Server Installation Guide*.

Configuring adaptors and virtual hosts

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

The server is divided into hierarchical levels: server, adaptor, virtual host, and application. The server is at the top level and contains one or more adaptors. Each adaptor contains one or more virtual hosts, and in turn, each adaptor contains one or more applications or services. You can add adaptors and virtual hosts to configure the server for hosting multiple applications and sites.

If you are hosting multiple websites on a server, use separate virtual hosts to give customers their own root folders. This allows you to keep separate settings, content, and log data for each customer.

You can assign an IP address or port number to an adaptor, but not to a virtual host. So, for example, if your customer needs their own SSL certificate, assign their virtual host to its own adaptor.

Optimizing server performance

There are several levels of configuration available with Flash Media Server:

- Server
- Adaptor
- Virtual host
- Application

Note: All editions of Flash Media Server 3 are preconfigured and ready to stream right out of the box. Changing settings may affect the performance and reliability of the server, so make changes carefully and be sure to back up the original XML files before making any changes. The most commonly edited settings are found in the FMS.ini file.

Each level has its configuration settings stored as XML files in the `RootInstall/conf` directory. There are also separate configuration files in this directory that control administrator accounts and logging.

You can edit configuration files in any text or XML editor. You must then restart Flash Media Server for any changes to take effect. For changes to the administrator account settings (`Users.xml`), you must also restart the Flash Media Administration server.

Server-level settings

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

The server has one initialization settings file, `fms.ini`, in the `RootInstall/conf` directory. This file contains commonly used settings, including the administrator username and password, and the settings you chose during installation. There is also only one `Server.xml` file, which controls settings such as connection request limits, idle connection timeout, IPv6 setup, SWF file verification, allowable domains, SSL/RTMPE configuration, and logging preferences. Edits made in the `Server.xml` file affect the entire server, unless they are overridden in a subsequent configuration file.

Adaptor settings

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

The `Adaptor.xml` file is the configuration file for individual network adaptors. It determines settings such as the number of threads that can be used by the adaptor, the communications ports that the adaptor binds to, and the IP addresses or domains from which the adaptor can accept connections, and RTMP versions that can be used. You can also implement SSL with the `Adaptor.xml` file, if you want each of your adaptors to use a different digital certificate.

Each adaptor has its own directory inside the `RootInstall/conf` directory. The name of the directory is the name of the adaptor. Each adaptor directory must contain an `Adaptor.xml` file.

For example, the default adaptor included with the server at installation is named `_defaultRoot_`, and its directory is `conf/_defaultRoot_`. To change an adaptor's settings, edit the elements in its `Adaptor.xml` file.

Virtual host settings

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

Setting up your server with virtual hosts allows you to maintain distinct separation between hosting accounts on the server for Flash Media Server. Each virtual host directory contains its own `Vhost.xml` file, which defines settings for an individual virtual host. These settings include aliases for the virtual host, the location of the virtual host's application directory, limits on the resources the virtual host can use, and other parameters.

Each virtual host must have its own directory inside the adaptor directory. The name of the directory must be the actual name of the virtual host, such as `streaming.adobe.com`. Each defined virtual host must be mapped to a Domain Name Server (DNS) entry or another name resolution, such as a Windows Internet Name Service (WINS) address or a hosts file, that specifies an IP address on the server computer.

Each adaptor must contain a `_defaultVHost_` directory in addition to the custom virtual hosts that you define. If a client application tries to connect to a virtual host that does not exist, the server attempts to connect it to `_defaultVHost_`. (If you are using a secure port for the adaptor that contains the virtual host, you can only define one virtual host for the adaptor, in addition to `_defaultVHost_`.)

Application settings

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

The `Application.xml` file contains the settings for Flash Media Interactive Server applications. These settings include the size of the server-side media ActionScript runtime engine, the location at which streams and shared objects are stored, default AMF encoding, and bandwidth limitations.

The `Application.xml` file in the virtual host directory configures the default settings for all applications within that virtual host. If you want to have different settings for a particular application, you can copy an Application.xml file to the application's registered application directory (`/applications/app_name`) and edit it to include your custom settings.

In most cases, the settings in the `Application.xml` file in the specific application directory override settings in the `Application.xml` file in the virtual host directory, but not always. For more details, see the *Adobe Flash Media Server Configuration and Administration Guide*.

User settings

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

To add, remove, or set permissions for Flash Media Server administrator accounts, edit the `Users.xml` file in the root level of the configuration directory. You can also configure Server Management API calls to the Flash Media Administration Server (for example, to allow or deny access to specific HTTP calls) within this settings file.

Log settings

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

With Flash Media Server 3.5, you have powerful logging capabilities, which can be highly customized for your specific application.

Also located at the root level of the configuration directory, the `Logger.xml` file controls settings for Flash Media Server log files. You can edit this file to specify the data that is logged, where the log files are saved, and how often they are rotated. The default location for the log files is in the logs directory in your server installation directory (`RootInstall/logs`).

The Logging section in `Server.xml` enables or disables the log files; `Logger.xml` contains the actual log file settings.

Note: Log files and field names within the log files are written in English. Some content in the log file, however, may be in another language, depending on the operating system.

Configuring performance features

Even with all the built-in optimizations in Flash Media Server 3.5, you may want to customize your installation for maximum efficiency. Several features that you may want to optimize for your specific needs are described here. For more detailed information, see the *Adobe Flash Media Server Configuration and Administration Guide*.

Note: For tips for optimizing Flash Media Server specifically for Linux installations, consult the article "Performance-tuning Flash Media Server 2 for live webcasts using Linux," at *www.adobe.com/devnet/flashmediaserver/articles/performance_tuning_webcasts.html*.

Stream cache/stream chunks

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

When a stream is requested from the server, segments of the stream are stored in a cache on the server. When the cache is full, the server removes unused segments, starting with the least recently used. You can set the size of the cache by changing the `SERVER.FLVCACHE _ MAXSIZE` parameter in the server's `fms.ini` file. The default value is 500MB.

Streamed content is broken into chunks as it is sent via RTMP. You can specify the size of these chunks in the `fms.ini` file. The `APP.DEFAULT _ CHUNKSIZE` parameter can be between 128 and 1024B, with a default value of 128. You can also set the stream chunk size for the VOD service separately by setting the `APP.VOD _ CHUNKSIZE` parameter. Larger values reduce CPU usage, but can also slow performance for clients on lower bandwidth connections.

Setting the size of the cache and stream chunks too high can result in slower performance. For example, if the cache size is greater than the available memory or if the server process exceeds the 2GB OS limit, the server process could terminate. However, if you set the size too low, all segments could theoretically be in use and unable to be exchanged for new stream segments. In this case, the stream requesting the new segment stops playing.

Process scopes

Feature in Flash Media Interactive Server; requires Flash Player 6 or later.

Flash Media Interactive Server can be scoped into different processes to increase the capacity of the server by overcoming natural OS limits for the CPU and RAM and for process isolation. Splitting your processes:

- Allows Flash Media Server to accept connections faster
- Allows Flash Media Server to store more FLV and MP3 data in RAM
- Expands the 2GB memory limit
- Isolates the instance, application, VHost, or adaptor from malformed scripts or denial of service (DoS) attacks.

For more information on process scopes, see the *Managing Flash Media Server* manual.

Flash Media Interactive Server lets you further increase your capacity and quality of service using distributed process scopes. Distributed process scopes and the `distribute` setting are discussed in the next section.

You can configure Flash Media Server to spawn FMSCore processes by configuring the scope node in the global `Application.xml` file. Valid scopes include `adaptor`, `vhost`, `app`, `inst`.

Depending on the scope you choose, you can configure each core process separately. For example, if you configure the system to scope adaptors to different core processes, each setting in the specific `adaptor.xml` file and all subsequent XML files are used to configure that core process. In this configuration, you can set each core process to listen on a different port, or change the SSL or HTTP tunneling settings.

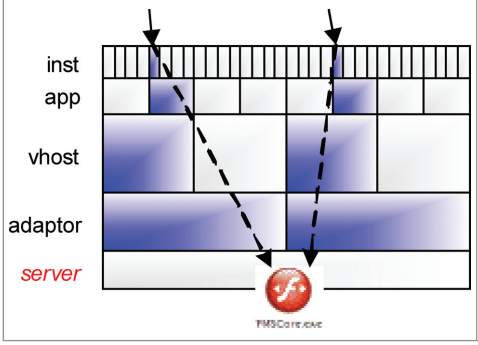
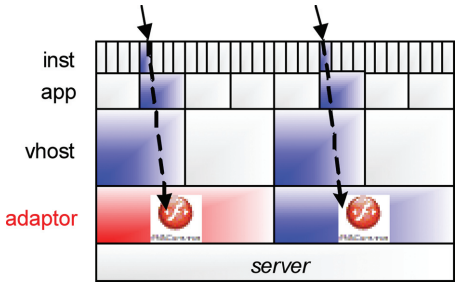
In another example, if you set scope to `app`, you can configure each core process with bandwidth limits, provided you have a separate `application.xml` file for each application running on your system.

The following process configuration is the default:

```
<Process>
    <Scope></Scope>
    <Distribute numprocs="1"></Distribute>
    <LifeTime>
    <RollOver></RollOver>
    <MaxCores></MaxCores>
    </LifeTime>
    <MaxFailures>2</MaxFailures>
    <RecoveryTime>300</RecoveryTime>
</Process>
```

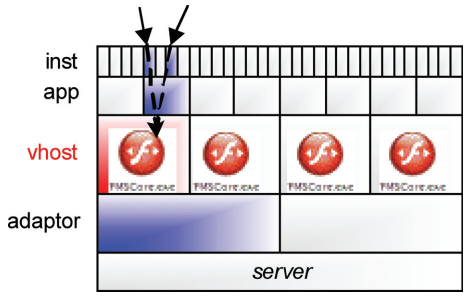
Let's look at how changing the scope setting affects your system. The following figures illustrate the effect of changing your scope configuration.

These settings are optimal for stateful applications where clients need to communicate with each other (chat, live video, gaming, or data-sharing solutions).

<scope></scope> No process scope (default setting). All clients connect to a single scope.	**<scope>adaptor</scope>** Process scope "adaptor." Each adaptor has its own core process. Virtual hosts and applications running on different adaptors do not interfere.
	

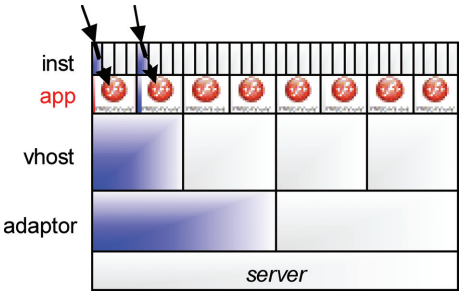
<scope>vhost</scope>

Process scope "vhost." Useful for applying unique settings for users in different subdomains.



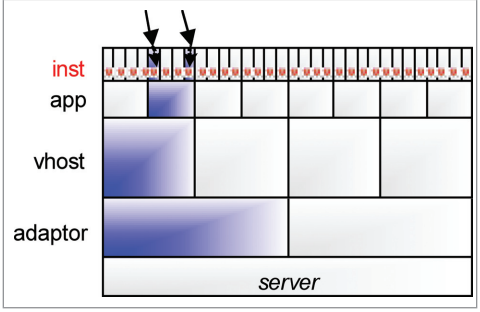
<scope>app</scope>

Process scope "app." Each application running can be run within its own process. Useful if you have lots of memory and heavy connection requests from different applications.



<scope>inst</scope>

Process scope "inst." Depends on your customer provision.



For a CDN customer (VOD profiles), selecting a scope depends upon how you provision your customer accounts. Consider that each customer is provisioned as an application within Flash Media Server. If there are a lot of customers, the app scope may not be the best option. Each process scope can use a maximum of 4GB of RAM, so too many processes may not be the best choice. Alternatively, if you have only a few large customers in your deployment, the app scope may be your best choice.

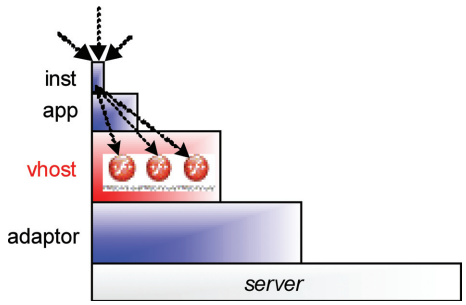
Distributed cores

Feature in Flash Media Interactive Server; requires Flash Player 6 or later.

To further increase the capacity and reliability of your server, you can distribute connections across multiple processes for a specific scope. For example, if your scope was set to adaptor, you could have connections spread across any number of core processes for each virtual host. In the following figure, there are four core processes for each virtual host. All connections on the single virtual host could be evenly distributed over three processes. If there were two virtual hosts, connections could be distributed across six core processes.

Distributed process scopes

There are three processes, each able to accept connections. Users connected to the same application may not be able to communicate or share RAM because they are connected to a different process. Useful for stateless deployments.



Like process scopes, the distributed core feature lets you increase the capacity of your server. Distributed cores let you engage more RAM for the cache and more threading for the process-intensive connection routine. Distributed cores are best used for VOD applications (commercial or social). They cannot be used when deploying a multiway hybrid or live solution because connections need to be on the same core process to share communication.

Inside the `Application.xml` configuration file, the default settings disable distributed process scopes.

```
<Process>
    <Scope></Scope>
    <Distribute numprocs="0"></Distribute>
    <LifeTime>
        <RollOver></RollOver>
        <MaxCores></MaxCores>
    </LifeTime>
</Process>
```

You can distribute connections to scopes in `<Scope>`. The following figure shows your options for process distributions. The left column shows the settings for `<Scope>`. The top row is the settings for `<Distribute>`. As you can see, if you set `<Scope>vhost</Scope>`, your options for `<Distribute>` are app, inst, and clients.

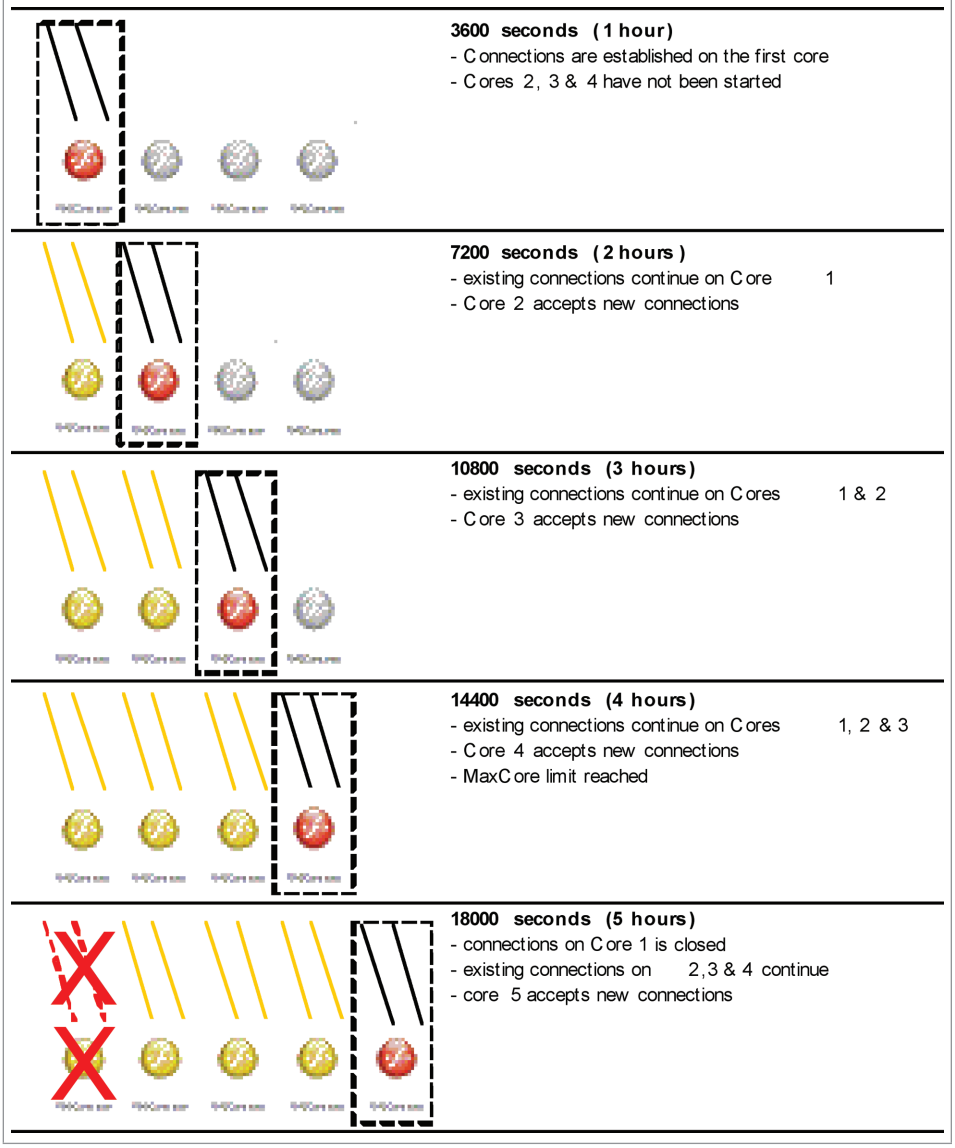
Distributed process scope options

	Distributed Processes				
	adaptor	vhost	app	inst	clients
server	☑	☑	☑	☑	☑
adaptor		☑	☑	☑	☑
vhost			☑	☑	☑
app				☑	☑
inst					☑

The following example shows process distribution with a single virtual host. The figure shows how the configuration is implemented over a 5-hour time frame given a 1-hour (3,600 second) rollover.

```
<Process>
    <Scope>adaptor</Scope>
    <Distribute numprocs="1">vhost</Distribute>
    <LifeTime>
        <RollOver>3600</RollOver>
        <MaxCores>4</MaxCores>
    </LifeTime>
</Process>
```

Distributed process scope options

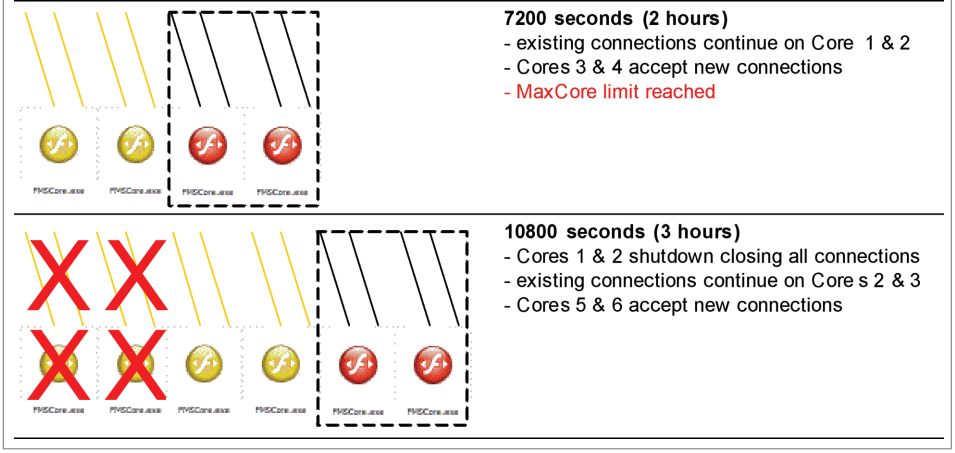

3600 seconds (1 hour)
- Connections are established on the first core
- Cores 2, 3 & 4 have not been started
7200 seconds (2 hours)
- existing connections continue on Core 1
- Core 2 accepts new connections
10800 seconds (3 hours)
- existing connections continue on Cores 1 & 2
- Core 3 accepts new connections
14400 seconds (4 hours)
- existing connections continue on Cores 1, 2 & 3
- Core 4 accepts new connections
- MaxCore limit reached
18000 seconds (5 hours)
- connections on Core 1 is closed
- existing connections on 2,3 & 4 continue
- core 5 accepts new connections

The maximum connection time using the above configuration is 4 hours. After 4 hours, the core process is closed and all connections are dropped. At this stage, the client SWF file initiates a reconnect routine that reestablishes the stream playback.

Changing the number of processes (numprocs) configures the number of processes in which connections are distributed. Changing the numprocs setting to 2 and using the same settings as before reduces the maximum connection time from 4 hours to 2 hours. After the second hour, the `MaxCores` limit of 4 is reached. To spawn two more processes, the first two processes are killed, and the connections are closed.

```
<Process>
 <Scope>adaptor</Scope>
 <Distribute numprocs="2">vhost</Distribute>
 <LifeTime>
 <RollOver>3600</RollOver>
 <MaxCores>4</MaxCores>
 </LifeTime>
</Process>
```

Example of distributed process configuration


7200 seconds (2 hours)
- existing connections continue on Core 1 & 2
- Cores 3 & 4 accept new connections
- MaxCore limit reached
10800 seconds (3 hours)
- Cores 1 & 2 shutdown closing all connections
- existing connections continue on Core s 2 & 3
- Cores 5 & 6 accept new connections

The maximum lifetime for connections in this configuration is 2 hours, because the `MaxCore` limit is set to 4 and the `numProcs` is set to 2.

To calculate the *maximum connection time* for clients, use this formula:

```
(MaxCore DIV NumProcs) x Rollover
```

```
Example: (4 DIV 2) X 3600 = 7200 seconds (2 hours)
```

To calculate the total number of processes, use this formula:

```
Number of Scopes X NumProcs X MaxCores
```

Example using `<Distribute>adaptor</Distribute>` with two adaptors:

```
2 X 2 X 4 = 16 Core processes
```

To calculate the amount of RAM required to support the distributed processes, multiply the total number of processes by 4. Each core process can use up to 4GB of RAM; therefore, the previous example with 16 cores could consume up to 64GB of RAM.

Close idle connections

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

When clients leave an application, their connection is often left open. Flash Media Server 3.5 can detect these idle connections and reclaim their resources for new and active clients. When a client has been idle longer than the maximum specified idle time—the default is 10 minutes—the server closes the connection. To enable this feature, you must set `AutoCloseIdle-Clients` to true in the `Server.xml` file. After it is enabled in the `Server.xml` file, you can disable it for individual virtual hosts or individual applications in the `Vhost.xml` and `Application.xml` files.

Limit connection requests

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

In some cases, if many clients are attempting to connect to the server, the quality of service can be diminished for those clients who are already connected. By setting the `MaxConnection Rate` in the `Server.xml` file, you can limit the number of connection requests per second that are accepted.

Send aggregate messages

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 9,0,115,0 or later.

By default, applications break up aggregate messages into individual messages before delivering them to clients. You can configure applications not to deliver aggregate messages by setting the `AggregateMessages` parameter to false in the `Application.xml` file.

Sending aggregate messages reduces CPU usage and increases server capacity. However, it can introduce some latency, so it is not recommended for real-time, one-to-one communication. It is recommended for on-demand and live broadcast applications where latency has little effect.

Configure content storage

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

Storage configuration is important to server performance. If your hard disk access is not fast enough to keep up with the bit rate of your content, your clients receive buffer empty messages, and the overall quality of service suffers.

The server can use local or network storage to serve media files. In the `Application.xml` file, you can change the default location where streams and shared objects are stored, and map virtual directories to physical directories on local or network storage to manage your content. This can be very convenient in team environments, when you may not always want content creators to have direct access to your Flash Media Server, or if you have a large library of media files that you don't want to copy to your Flash Media Server.

Configuring security features

Flash Media Server 3.5 has several security features that you can easily set in the configuration files. For more information about securing your server and content, see the "Security features" section.

Verify SWF files

Enhancement in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 9,0,115,0 or later.

You can configure the server to verify client SWF files before allowing them to connect to an application. Verifying SWF files prevents someone from creating their own SWF files that attempt to stream your content or using your server resources. The server compares the connecting SWF file with existing SWF files on your Flash Media Server and allows the connection if there is a match.

In the Application.xml file, you can specify one or more folders on the server to hold these SWF verification files locally. This is done within the node <SWFVerification>. You can also configure the versions to check the length of time the verification data is held in cache, and any exceptions (such as Flash Media Live Encoder). You can also configure how often the server should check for updated SWF verification files. Here is a sample from the Application.xml file. By default SWFVerification is turned off.

```
<SWFVerification enabled="true">
    <SWFFolder />
    <MinGoodVersion />
    <UserAgentExceptions>
        <Exception from="" to="" />
    </UserAgentExceptions>
    <Cache>
        <TTL>1440</TTL>
        <UpdateInterval>5</UpdateInterval>
    </Cache>
</SWFVerification>
```

With Flash Media Interactive Server 3.5, you can now use the File plug-in to perform verification on SWF files that are stored in remote locations. This gives you even greater flexibility and efficiency in securely deploying applications. For more information, see the *Flash Media Interactive Server Plug-in Developer Guide*.

Allow domains to connect to a virtual host

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

You can specify a list of domains that are allowed to connect to a particular virtual host. By default, connections are allowed from all domains. Set the VHOST.ALLOW parameter in the fms.ini file to a comma-delimited list of host names, domain names, and full or partial IP addresses that you want to allow access to the virtual host.

Limit access to Flash Media Administration Server

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

By default, a client can connect to Flash Media Administration Server from any domain or IP address, which can be a security risk. You can change this by editing the AdminServer parameter in the Server.xml file. Simply add a comma-delimited list of host names, domain names, and full or partial IP addresses that you want to allow. The default value is "all."

Administration API via HTTP

Feature available in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

You can monitor Flash Media Server via simple HTTP commands. The Flash Media Administration API methods can be called over HTTP connections. In the fms.ini file, set the USERS.HTTPCOMMAND _ ALLOW parameter to a comma-delimited list of APIs. You can also specify methods on a more granular user-based level in the Users.xml file.

Most users leverage this feature to write custom monitoring applications. You can monitor the capacity of the server, including the number of connections, bandwidth used, and number of streams in cache, and even restart the server.

Encrypted RTMP (RTMPE)

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 9,0,115,0 or later.

By default, the encrypted RTMP (RTMPE) is enabled in the server's `Adaptor.xml` file and offers 128-bit encryption. If you want to disable RTMPE, change the `ADAPTOR.RTMPE _ ENABLED` parameter to "off."

You should only turn off RTMPE if you do not want it to be available to developers deploying applications on your server. RTMPE does require more CPU power compared to standard RTMP. Otherwise, leave it enabled so that it is available when you want to use it.

Secure Sockets Layer (SSL)

Feature available in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

Like RTMPE, SSL is a protocol that enables more secure communication. Unlike RTMPE, SSL requires a certificate signed by an intermediate Certificate Authority. SSL must first be configured in the `Server.xml` file; certificates can also be set up to secure independent adaptors or independent virtual hosts.

For more details about security settings for Flash Media Server, see the "Securing content with Flash Media Server 3.5" section.

Configuring general settings

A number of helpful settings are available to streamline and customize your application deployment.

Allow application debugging connections

Feature available in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

The Flash Media Administration Console and the API can connect and "listen" to SharedObjects and Streams. This feature makes it easier to debug complex server-side applications. By default, the server does not allow debugging connections. However, the Flash Media Server Administration Console must make this special debugging connection to the server to play back streams and access shared object data.

To allow debugging connections, edit the `Application.xml` file of the virtual host or application you want to access. You edit the node shown below to enable debug connections. After changing the setting, you must restart both the Flash Media Server and Flash Media Server Administration service and reload the Administration Console.

```
<Debug>
    <MaxPendingDebugConnections>50</MaxPendingDebugConnections>
    <AllowDebugDefault>true</AllowDebugDefault>
</Debug>
```

Alternatively, you can use HTTP to monitor the server activity.

Define application object properties

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

With Flash Media Server 3.5, you can define global properties that are accessible to all application instances on a specific virtual host. If you define these application properties in an `Application.xml` folder in a particular application folder, the properties are only available for that application.

For example, if you create a global `application _ owner` property, every instance of that application could access that property using this syntax:

```
Application.config.application _ owner
```

Enable/disable native bandwidth detection

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

Flash Media Server 3.5 can detect a client's bandwidth using native bandwidth detection or server-side ActionScript (called script-based bandwidth detection). Because native bandwidth detection is built into the core server code, it is much faster than script-based detection. Native bandwidth detection is enabled by default and can be further configured in the `Application.xml` file.

Activity logs

Enhancement available in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

Flash Media Server 3.5 offers real-time server monitoring and extensive logging capabilities to help you with server management and troubleshooting. The log files track activity such as general traffic and server load, who is accessing the server, client behavior and interaction, and general diagnostics.

Flash Media Server maintains several different types of logs that track information about the following:

- Access log—Users accessing the server
- Application log—Activities in application instances
- Diagnostic log—Server operations
- HTTP log—Apache HTTP Server access and errors

Flash Media Server access log files are written in W3C format. You can use standard parsing tools to parse these log files.

Access logs

The access log records information about connection requests by Flash Player and Flash Media Server application instances. The default configuration creates a single access log per server, called `access.XX.log`, which is located in the Flash Media Server logs directory. You can also configure Flash Media Server to create a separate access log for each virtual host. The "XX" in the filename is a two-digit number representing the version of the log (for example, `access.00.log` contains the most recent logs).

The access log records data such as:

- Date and time a client connected to the server
- How much total bandwidth was consumed during the session
- Which streams were accessed by the connection
- Whether the client published a stream
- Whether the client jumped to a new location within a recorded stream

Application logs

The application logs record information about activities in application instances. These logs are especially useful for debugging applications.

The default configuration creates one application log per application instance, called `application.XX.log`, which can be found in the application or instance folder of the corresponding virtual host.

Application logs record application event data such as:

- Date and time of the event
- Event's server process ID
- Event status level (warning, error, information, debug, and so on)

Diagnostic logs

The diagnostic logs record information about Flash Media Server operations and are used primarily for debugging server-level issues.

Flash Media Server is configured, by default, to create a diagnostic log for each type of process. The default diagnostic logs are `master.XX.log`, `edge.XX.log`, `core.XX.log`, `admin.XX.log`, and `httpcache.XX.log`. All of the diagnostic logs are located in the Flash Media Server logs directory.

A wide variety of useful data such as information about stream events, application instances, virtual hosts, and Edge and Origin issues can be obtained through close examination of the diagnostic log files.

HTTP logs

There are two separate log files that track activity on the built-in Apache HTTP Server. The `httperror.xx.log` tracks information about HTTP server errors. The `httpaccess.xx.log` tracks HTTP server access details.

Using server tools

Load Simulator tool

New feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

The Load Simulator tool is a new, cross-platform, standalone tool that creates a streaming load on a Flash Media Server. The artificial load enables you to test the capacity of your configuration and deployment of Flash Media Server. You can obtain quantitative measurements from the application and perform benchmark testing. The tool has a simple GUI, along with command-line control for more advanced users.

The Load Simulator tool supports the same platforms as Flash Media Server, including Windows 2003, Windows 2008, Windows XP, and Linux RH4 and 5. Because Flash Development Server supports only up to 10 simultaneous connections, this tool is intended to be used with authorized Flash Media Servers.

The Load Simulator tool is available as a free download from *www.adobe.com*.

Administration API

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

You can use the Administration API to monitor, manage, and configure the server from a Flash Player or Adobe AIR client over RTMP or from a web client over HTTP. The Flash Media Server Administration Console was built using the Administration API. You can also use the API to create custom administration tools. Some of the methods available to you include:

- Add and delete administrative users
- Start and stop the server, virtual hosts, and applications
- Initiate garbage collection
- Get and set the server configuration

The API is described in detail in the *Adobe Flash Media Server Administration API Reference*.

Server healthcheck utility

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Windows or Linux.

In addition to the Administration Console and server logs, you can use FMSCheck to help evaluate the overall health of Flash Media Server. FMSCheck is a command-line utility program that diagnoses and determines server status. The tool is installed with Flash Media Server and is available for both Windows and Linux. As a command-line utility, it can easily be integrated with your back-end monitoring systems.

`FMSCheck` provides information such as whether the server is running, what the response time is, and which core processes or applications are not responding. It can also check every active instance of every application currently running on the server to be sure each one is accepting connections as expected.

FMSCheck can save the Flash Media Server administrator the significant time and effort it takes to manually check applications and streams. Test connections can be run in parallel or staggered, depending on the desired test.

Video validation utility

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Windows or Linux; no Flash Player.

With the large number of encoding technologies able to convert video into a Flash Player compatible format, inconsistencies in video encoding can occur. The FLVCheck command-line tool lets you validate if a particular video can be streamed from Flash Media Server and whether it is corrupted or encoded with missing information.

FLVCheck validates both FLV and MPEG-4 files. It checks the data structure, including the headers, time stamps, and metadata. You can write scripts or use FLVCheck in an automated environment. For FLV files (On2 and Sorenson codecs), the tool fixes minor errors to make sure that the files run or that they do not corrupt the server.

Scaling Flash Media Server 3.5

Servers have a finite capacity, so as traffic and throughput increases, applications need to be scaled to preserve quality of service. Flash Media Server offers several flexible options for graceful scaling of high-traffic applications.

Cluster deployment

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

You can deploy multiple servers behind a load balancer to distribute the application load evenly. Flash Media Server clustering enables you to scale an application to accommodate more clients reliably. You can also create redundancy, which eliminates single points of failure. Clustering is generally best for live or VOD streaming, where clients do not need to communicate with each other from within specific application instances. Clustering can be achieved using either Flash Media Streaming Server or Flash Media Interactive Server.

Flash Media Server intelligent balancing

Feature in Flash Media Interactive Server; requires Flash Player 6 or later.

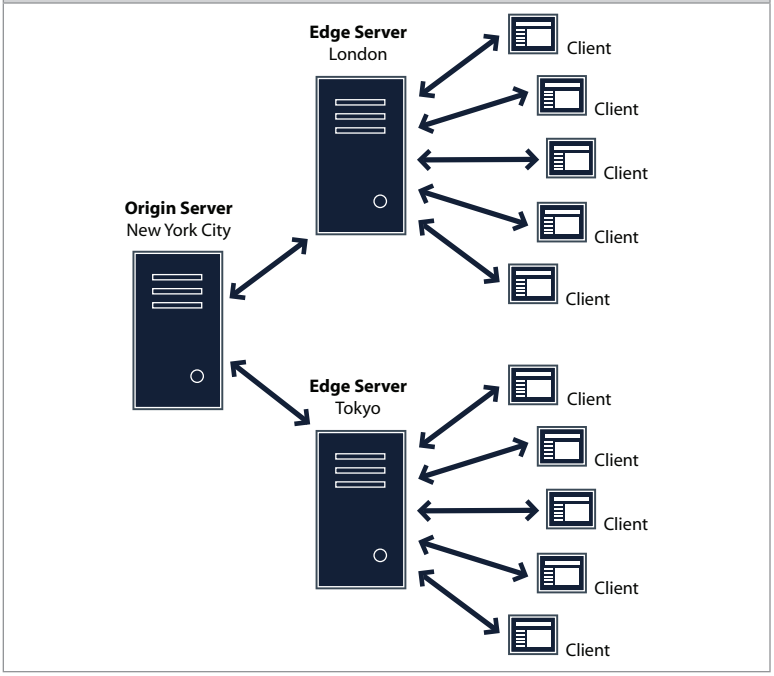
With the Flash Media Interactive Server, you can intelligently direct traffic to a multiple server cluster using server-side scripting. This option would typically be used for multiway communication applications that require connections to be routed to a specific server. This option does require development of rather sophisticated server-side ActionScript to manage connections.

Edge and Origin configurations

Feature in Flash Media Interactive Server; requires Flash Player 6 or later.

In versions prior to Flash Media Server you had to purchase the Edge and Origin editions to achieve distributed caching and load balancing. This functionality is now built into Flash Media Interactive Server. Flash Media Interactive Server provides an enterprise-ready architecture designed to simplify load balancing, failover, and clustering to ensure maximum availability over large regions. The following figure shows the Edge and Origin architecture.

Edge/Origin architecture



How Edge and Origin deployments work

Edge and Origin server configurations improve performance by distributing the server load among many computers on a network. With an Edge and Origin deployment strategy, all connection requests from clients are redirected to an Edge server. The configuration also lets you maximize your network if you are supporting a large local network. By placing Edge servers in remote office locations, the Edge servers cache media files locally, so each stream does not need to access the Origin (host) server for each stream.

Typically Edge and Origin deployments are best used with one-way streaming services. When using custom server-side applications to enable real-time communication, the Edge server strictly handles the requests on behalf of the Origin server. Client connections then make roundtrips to the Origin server to run the application.

In Flash Media Interactive Server 3.5, Edge-level support for bandwidth detection and stream length detection has been integrated. The first server in the chain (Edge or Origin) receiving a stream call also handles the bandwidth check and stream length check without calling the Origin server script layer. This feature is compatible with the FLVPlayback component for Flash 8, Flash CS3 Professional, and Flash CS4 Professional.

When a client request is received, the Edge server handles the tasks it can, and then makes a connection to the Origin server for any additional data required. When the Origin server fulfills the request, the data is sent back to the Edge server, and then onto the client. To the client, it appears that the connection is made directly to the application running on the Origin server.

The Edge server serves as a "traffic cop"—handling connection overhead, authentication, and other administrative duties—freeing up valuable system and network resources for the Origin server. Every connection and connection attempt consumes resources over and above the actual stream data flowing through the connection. As the number and frequency of connections increase, the load can be excessive, adversely affecting server performance. The Edge server greatly reduces this load by aggregating connections. It multiplexes the connections from a large number of clients into one connection to the Origin server. All communications between the Edge and Origin servers are transparent to clients.

The Edge server also stores the prerecorded media content received from the Origin server in a cache, which is then made available to other clients that connect to the Edge server. Caching static content further reduces the load on the Origin server.

Deployment strategies

A simple way to distribute load among Edge servers is to assign users in a geographical region or other delineation to a specific Edge server. For example, one Edge server may aggregate and forward requests from clients in London, while another may handle requests from Tokyo.

A typical networked Flash Media Server deployment can involve multiple Edge servers, deployed either individually or in clusters. Edge servers can also be chained, allowing even further distribution of traffic.

To enable the Edge and Origin feature, you can configure any server in your cluster as your Origin server (or servers) and the rest as your Edge servers. All editions in an Edge and Origin configuration must be the same (for example, you cannot mix Flash Media Streaming Server and Flash Media Interactive Server editions in a cluster).

Large-scale Flash Media Server deployments are supported with the Flash Media Server Edge and Origin configuration. For an introduction to Flash Media Server Edge and Origin servers, see the Deploying the Server Chapter in the *Configuration and Administration Guide*.

Edge servers are also referred to as proxy servers. There are four ways to configure a Flash Media Server Edge (or proxy) server:

- Client auto-discovery proxy
- Server auto-discovery proxy (reverse proxy)
- Explicit URI
- Implicit URI (recommended)

Typically, implicit URI is the recommended setting because it is the most secure and requires the least amount of communication. It can hide the Origin server URI, and it is the easiest to set up. Therefore, we will explore the implicit URI configuration, but all these methods are described in *Using Flash Media Server Edge Servers*.

Configuring proxy servers using implicit URI

The following settings define the virtual host as a proxy server. This configuration allows the client to connect with the Edge server without exposing the proxy server.

```
<Proxy>
  <Mode>remote</Mode>
  <Anonymous>false</Anonymous>
  <CacheDir enabled="true" useAppName="true">d:\fmsCache\</CacheDir>
  <LocalAddress></LocalAddress>
  <RouteTable protocol="">
```

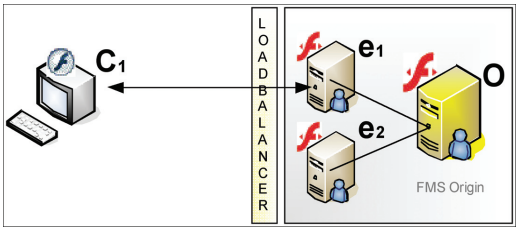
```
    <RouteEntry>edge1.fms.com:*;192.168.110.150:1935</RouteEntry>
  </RouteTable>
</Proxy>
```

The connection string would look like:

```
rtmp://edge1.fms.com/ondemand/
```

The Flash Player connects to the Edge server and does not expose the Origin server at 192.168.110.50, as shown in the following figure.

Edge server using a single Origin server



You can configure Edge servers to create proxy clusters. In the following figure, notice how an Edge server (e1) can proxy the Edge server (e0) in its `routeEntry` tag. The e0 Edge server proxies the Flash Media Server Origin. This type of configuration allows you to build Flash Media Server Edge clusters that are geographically balanced.

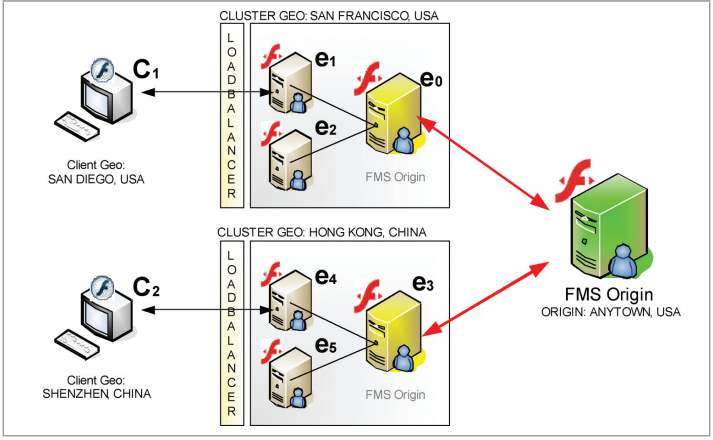
`RouteEntry` for the cluster members points to a main Edge server.

```
<RouteTable protocol="">
<RouteEntry>edge1.fms.com:*;edge0.fms.com:*;</RouteEntry>
</RouteTable>
```

`RouteEntry` for the main proxy (Edge server) in the cluster points back to the Origin server.

```
<RouteTable protocol="">
<RouteEntry>edge0.fms.com:*;origin.fms.com:*;</RouteEntry>
</RouteTable>
```

Edge server cluster using a master Edge and a single Origin



Using live video

Flash Media Server allows you to broadcast live streams with a wealth of interactive features. Connected clients only need Flash Player or an Adobe AIR application to view the live broadcast.

A new feature of Flash Media Server 3.5, you can now record H.264 server-side streams, allowing you to create interactive HD media applications leveraging DVR functionality. You can easily create your own custom live video broadcast application using the Flash integrated development environment (IDE) or Flex Builder. It's important to note that video captured and broadcast through a Flash Player interface is encoded using the Sorenson Spark video codec and the Nellymoser audio codec. These formats are generally acceptable and quite efficient for real-time conferencing. However, if you require VP6, H.264, AAC, or MP3 encoding, or you don't need the flexibility of a completely customized encoding interface, you may want to consider using the standalone Adobe Flash Media Live Encoder.

Flash Media Live Encoder 3

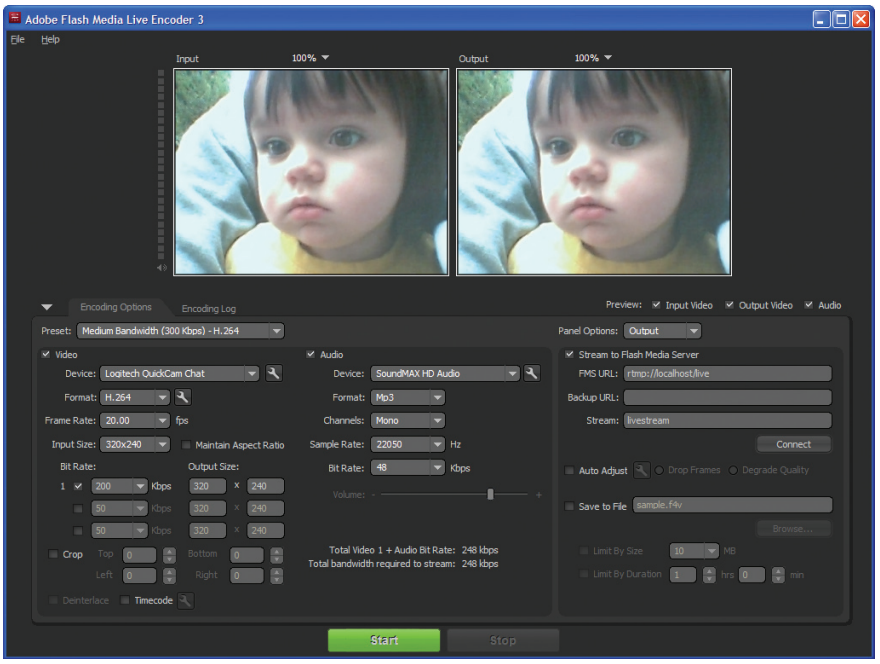
Adobe Flash Media Live Encoder 3 is a Windows Server, Windows XP, or Windows Vista® based live encoding application, designed to enable event producers to capture live audio and video while streaming it in real time to Flash Media Server or FVSS. Featuring simple out-of-the-box setup and operation, Flash Media Live Encoder requires no scripting knowledge to begin broadcasting high-quality streams 24 hours a day, 7 days a week for events such as sports, concerts, webcasts, and seminars.

With an intuitive user interface (shown in the following figures) that works with a wide array of plug-and-play cameras, microphones, and compatible analog-to-digital converters, Flash Media Live Encoder 3 also provides size and bit-rate flexibility. Flash Media Live Encoder 3 streams are compatible with Flash Player 8 or later.

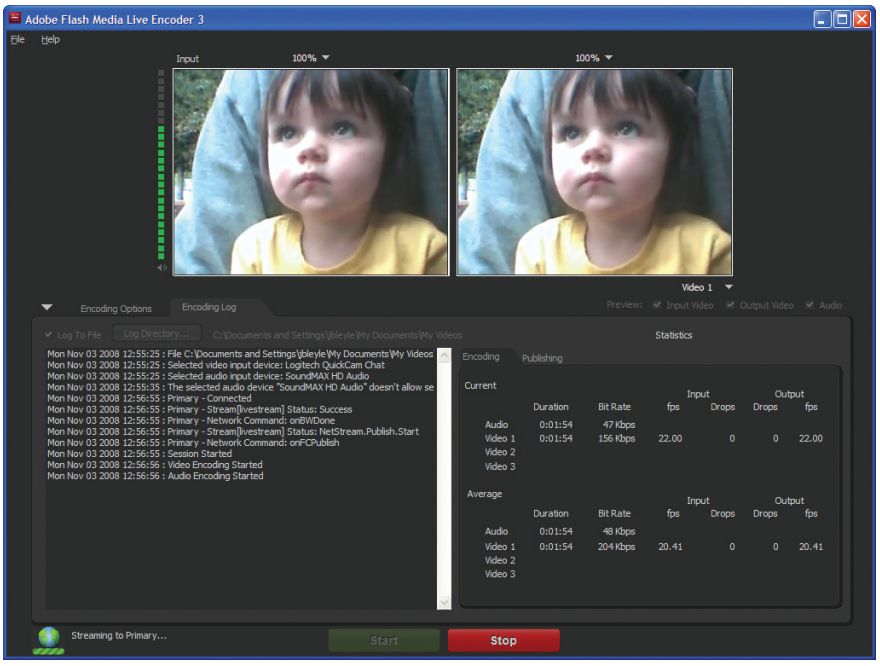
Some powerful new features include:

- Multi-bit-rate encoding—Encode up to three streams at different bit rates, simultaneously.
- Auto adjust—Automatically adjust encoding quality by dropping frames or degrading quality if network conditions degrade.
- Parameters in file and stream names—Include parameters such as bit rate and others to generate meaningful stream names and filenames.
- Chunking of output files—Limit the size and duration of output files by encoding a single stream in separate chunks.
- Updated user interface—Use the streamlined and more intuitive interface.

Flash Media Live Encoder interface



Flash Media Live Encoder live broadcast log


Adobe Flash Media Live Encoder 3
File Help
Input 100%
100%
Video 1
Encoding Options
Encoding Log
Preview: Input Video Output Video Audio
Log To File
Log Directory...
Statistics
Encoding
Publishing
Mon Nov 03 2008 12:55:25 : File C:\Documents and Settings\bleyle\My Documents\My Videos
Mon Nov 03 2008 12:55:25 : Selected video input device: Logitech QuickCam Chat
Mon Nov 03 2008 12:55:25 : Selected audio input device: SoundMAX HD Audio
Mon Nov 03 2008 12:55:35 : The selected audio device "SoundMAX HD Audio" doesn't allow se
Mon Nov 03 2008 12:56:55 : Primary - Connected
Mon Nov 03 2008 12:56:55 : Primary - Stream[livestream] Status: Success
Mon Nov 03 2008 12:56:55 : Primary - Network Command: onBWDone
Mon Nov 03 2008 12:56:55 : Primary - Stream[livestream] Status: NetStream.Publish.Start
Mon Nov 03 2008 12:56:55 : Primary - Network Command: onFCPublish
Mon Nov 03 2008 12:56:55 : Session Started
Mon Nov 03 2008 12:56:56 : Video Encoding Started
Mon Nov 03 2008 12:56:56 : Audio Encoding Started
Current
Duration Bit Rate fps Drops Drops fps
Input Output
Audio 0:01:54 47 Kbps
Video 1 0:01:54 156 Kbps 22.00 0 0 22.00
Video 2
Video 3
Average
Duration Bit Rate fps Drops Drops fps
Input Output
Audio 0:01:54 48 Kbps
Video 1 0:01:54 204 Kbps 20.41 0 0 20.41
Video 2
Video 3
Streaming to Primary...
Start
Stop

Flash Media Live Encoder 3 can also be tightly integrated into your current streaming workflow with command-line control both locally and through a remote connection via Microsoft Remote Desktop Connection or Virtual Networking Computing (VNC). Among other powerful features, auto-restart after power failures or other system restarts also helps ensure that your live streams are reliably available. When using a device that can generate timecodes, you can embed an SMPTE timecode into the video stream. You can also embed system timecodes into the stream if you prefer.

A significant benefit over broadcasting direct from the Flash Player, Flash Media Live Encoder 3 allows you to broadcast video using either the VP6 or H.264 codec, and now supports multi-bit-rate encoding (up to three simultaneous streams). You also have greater audio control with bit-rate-efficient Nellymoser, MP3, or AAC encoding.

Flash Media Live Encoder is available as a free download from Adobe at: *www.adobe.com/go/fmle*.

Data keyframes

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

With the data keyframe feature in Flash Media Server 3.5, metadata can be sent whenever a new subscriber requests the stream. The metadata can also be updated at any time by dispatching a new data keyframe via server-side or client-side ActionScript or via Flash Media Live Encoder. This new metadata is then received by all connected clients through the `onMetadata` event handler.

A data keyframe is a special data message that can be set to a live stream and stored in the memory of the server. Like the other data messages, a data keyframe contains a handler name and a list of properties that store the data. There is no limit to the number of data keyframes that can be set. For security reasons, only the publisher and the server are allowed to set and clear the data keyframes.

Data keyframes are sent from the client through `NetStream.send()` or `Stream.send()` in the server-side script. Two special methods, `@setDataFrame` and `@clearDataFrame`, are defined to set and clear the data keyframe. To avoid collision with other client defined methods, an `@` sign is added to these methods.

Multipoint publish

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later.

Another challenge for live broadcasting is scalability. Due to the limitations of processor resources or network bandwidth, one server can support only a fixed number of subscribers. To support more simultaneous viewers, some of the traffic needs to be handled by other servers. Multipoint publish allows the broadcaster to publish to multiple servers with only one client-to-server connection.

In the past, the API in the server-side script would only allow streaming from a remote server in one direction through the use of server `Stream` and `NetConnection` objects. This made it possible to play a stream from a remote server. However, there was no way to remotely publish a stream to a remote server or to know which streams were attempting to be published to another server, unless one-to-one connections were maintained between all servers. In addition, because of restricted server-side script access on content delivery networks, stream republishing was not possible.

With the APIs available in Flash Media Interactive Server 3.5, broadcasters can dynamically redirect streaming data to another server when necessary, without maintaining a persistent connection between servers and without custom server-side code. New server-side notification, `Publish` and `Unpublish` events, is now available for those who require additional customization.

Multipoint publishing provides a much-needed degree of flexibility, customization, and scalability to large-scale live video applications. For more details, consult the *Flash Media Server Developer Guide*.

Securing content with Flash Media Server 3.5

Whenever content is distributed electronically, there is some risk of it being copied, misappropriated, or redistributed. Flash Media Server offers several levels of security to protect your content and server resources that are unobtrusive, intuitive, and convenient to consumers.

Content vulnerabilities

Online digital content can be compromised a number of ways:

- **Raiding the browser cache**—Though the filenames are not easily read, it is relatively simple to retrieve video files from the browser cache. This vulnerability is only present with progressive video delivery; streams are never cached.
- **Video URI access**—Video URIs can be easily discovered using free "sniffer" utilities.
- **SWF file re-serving**—Your SWF file can be copied and re-served from another domain. SWF files can also be decompiled, often revealing your Flash Media Server address, application, and stream names.
- **Replay technologies**—Also referred to as "stream ripping," this is the most insidious of security issues because it is more difficult to prevent. Stream ripping utilities intercept the data stream and record it to a file that can then be played.

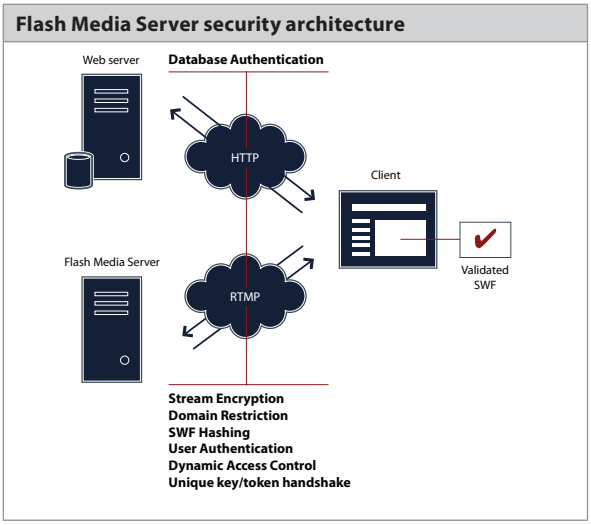
Flash Media Server security architecture

Streaming has a higher level of security than progressive delivery, because media files are never cached to disk. Flash Media Server further enhances protection against other risks with additional security features:

- User authentication using server-side ActionScript
- Authorization adaptor
- Access adaptor
- SWF file verification
- Domain access control
- Custom solutions offered by content delivery networks
- Stream encryption using RTMPE or RTMPS

First, we'll look at the overall Flash Media Server security architecture as shown in the following figure and then examine each of the protection measures in depth. Regardless of the sensitivity or ownership of your content, you'll want to implement some level of security when deploying to the web. It's best to begin by securing your server, and then securing your content.

Flash Media Server security architecture



Restrict access from domains

By default, a client can connect to Flash Media Server from any domain or IP address, which can be a security risk. You can create a whitelist of allowed domains (or a blacklist of banned domains) to ensure that only authorized clients can connect to your applications or services. You can add a comma-delimited list of domains and IP address blocks in the `Adaptor.xml` or `vHost.xml` configuration files to add this level of security. This is usually the first step in locking down your server. It prevents malicious or unauthorized domains from freely accessing your applications and streams.

Server-side ActionScript

Flash Media Server 3.5 has several user authentication methods available. This section discusses the server-side ActionScript method to implement a user authentication scheme to validate the connecting client. For example, using variables passed in through the client `NetConnection` method, you could implement a simple username and password, an encrypted token (MD5 Hash), or a unique key.

- User credentials (login and password)

```
NetConnection.connect("rtmp...", "username", "password");
```

- Encrypted token (MD5 Hash)

```
NetConnection.connect("rtmp...", 6aef79f07bc8f23c38e8979f3630f436);
```

- Unique key

```
NetConnection.connect("rtmp...", 349jh3k4324h9.234234098);
```

Then, on the server-side, Flash Media Server would be able to integrate with web services (SOAP), Flash Remoting, XML, HTTP Post (`loadVars`), or simple file access to validate the client based on the data sent. This authentication scheme could be as simple as checking login information against a database or as complex as creating an SSL-based token system using ColdFusion.

Access adaptor plug-in

Improved feature in Flash Media Interactive Server; requires Flash Player 6 or later.

An access adaptor is a server plug-in written in C++ that intercepts connections to the server and determines whether requests should be accepted, rejected, or redirected before the requests reach the server's script layer. You can create custom logic in the access adaptor to handle client connection requests. For example, you could query your account database upon client login and then update the database record after the client connection was accepted.

The access adaptor can be configured to accept or reject requests based on the number of clients currently connected or the amount of bandwidth currently being consumed. You can also set read and write access for files and folders on the server, set permissions to access audio and video bitmap data, and inspect client properties through the access adaptor.

When you use the access adaptor, you are catching the connection before it is processed by Flash Media Server. For this reason, you are limited to trapping only the connection events. If you want to apply additional rules after the connection is established, you need to configure an authorization adaptor.

Note: There can only be one Access plug-in per Flash Media Interactive Server installation.

Authorization adaptor plug-in

Feature in Flash Media Interactive Server; requires Flash Player 6 or later.

The next line of defense is the authorization adaptor. A server plug-in written in C++, the authorization adaptor authorizes client access to server events. After the connection has been established but before it is accepted, the authorization adaptor comes into play.

Authorization adaptors can:

- Authorize connections to the server
- Authorize playing a stream or seeking in a stream
- Authorize publishing a stream
- Disconnect clients from the server
- Call a method in server-side ActionScript
- Deliver content to clients according to their geographic location, subscription level, and stream Origin
- Limit time and duration of a user's access to specific streams
- Map a logical stream path to a physical stream path. For example, a client requests the stream foo.flv, but because the client is not a premium member of the service and should only receive the low-quality version of that content, bar.flv is served instead.

Unlike the access adaptor, you can use multiple authorization adaptors to sequentially perform actions on the incoming event. For example, `auth1.dll` (or `auth1.so`) could authorize the client connection; `auth2.dll` (or `auth2.so`) could then authorize that client to publish a stream, and so on. The server applies the adaptors in alphabetical order.

As you can see, authorization adaptors can be very powerful for stream security and access control at a granular level. They can be configured to implement custom functionality ranging from rights management to logging.

Dynamic access control

When clients access the server, they have full access to all streams and shared objects by default. Access control is possible, however, using server-side ActionScript. You can create a dynamic access control list (ACL) that controls who has access to read, create, or update shared objects or streams.

In server-side ActionScript, each client that connects is assigned to a Client object. Each Client object has `readAccess` and `writeAccess` properties. These properties can accept multiple comma-delimited values. By setting these values when you accept the client connection, you can control which streams and shared objects any given client can access.

Stream encryption

Flash Media Server 3.5 offers two options for encrypting your streams: SSL and RTMPE.

SSL

Feature available in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 8 or later.

In earlier versions of Flash Media Server, encrypted streaming was available using SSL delivery through RTMPS. This form of encryption is still supported in Flash Media Server 3.5. Implementation requires the use of a third-party certificate with some server-side configuration. Flash Media Server 3.5 now offers an easier, optimized way to implement an encryption solution using encrypted RTMP (RTMPE).

RTMPE

Feature in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 9,0,115,0 or later.

Encrypted RTMP (RTMPE) is enabled on Flash Media Server by default. It allows you to send streams over an encrypted connection without requiring certificate management. Offering secure 128-bit encryption, RTMPE is only supported in Flash Player 9 or later, with the updated FLVPlayback component and `NetConnection` classes. Both SSL and RTMPE can also be "tunneled" to ensure connectivity through network firewalls. RTMPE is the recommended form of encryption, because it is easier to deploy and is much faster than SSL.

Implementing stream encryption in your applications is easy. Simply specify the protocol when you connect to your application.

- SSL

```
NetConnection.connect("rtmps://yourFMSserver.com");
```

- Tunneled SSL

```
NetConnection.connect("rtmpts://yourFMSserver.com");
```

- Enhanced RTMP

```
NetConnection.connect("rtmpe://yourFMSserver.com");
```

- Tunneled enhanced RTMP

```
NetConnection.connect("rtmpte://yourFMSserver.com");
```

To provide maximum content protection, it is recommended that RTMPE be used in conjunction with SWF verification, and that standard RTMP be disabled when utilizing RTMPE or RTMPTE.

Defend against replay technologies

Replay technologies or "stream ripping" has been a difficult security issue to solve because it allows the viewer to directly access and record the data of a stream.

Stream encryption, used along with SWF verification, prevents stream ripping. In the past, SSL was the only choice, and it was too slow for most applications. Flash Media Server 3.5 uses RTMPE, which is much more efficient and easier to implement.

Another method of defense against stream ripping is to insert intelligence into your server-client communications. By adding additional code to your video player, you could require your SWF file to respond to a request from Flash Media Server to verify a unique string sent from the server, for example. This interrupts the flow of data to the stream ripping software, because it cannot respond with the correct data and will be denied access.

Digital Rights Management support

Enhancement in Flash Media Streaming Server and Flash Media Interactive Server; requires Flash Player 6 or later. RTMPE/SWF verification requires Flash Player 9,0,115,0 or later.

Digital Rights Management (DRM) has two key elements: encryption and access control. There are two ways to deliver video to a consumer: streaming or downloading. When you stream video from Flash Media Server, you immediately increase your protection.

Encryption with Flash Media Server is done in real time with RTMPS (SSL) or with RTMPE in Flash Media Server 3.5. On-demand content can also be encrypted using Flash Media Rights Management Server. Flash Media Server can stream this encrypted content to Adobe AIR applications, including Adobe Media Player. It can stream encrypted FLV files and encrypted F4V files, using either RTMP-based protocols, such as RTMPT or RTMPE, or HTTP. No specific configuration is required to allow Flash Media Server to work with Flash Media Rights Management Server.

Access control with Flash Media Server is done simply with SWF verification. Access control is much more powerful with Flash Media Interactive Server because of its new plug-in architecture, along with the server-side application layer. Using web services (SOAP), Flash Remoting, or XML, you can create a system with secure tokens that provide access control over your content.

These are the basic principles of DRM for streaming. For the download use case, you integrate with Flash Media Rights Management Server to deliver signed and encrypted media. For more information about rights management and Flash Media Rights Management Server, see *www.adobe.com/go/fmrms*.

Content protection with CDNs

An easy way to add content protection to your streaming content is to use FVSS through Adobe's CDN partners. Many of Adobe's FVSS partners offer plug-and-play restricted access and secure video-streaming solutions.

To learn more about how a CDN can help protect your content, visit *www.adobe.com/go/fvss*.

Glossary

Adobe AIR: A cross-platform tool that enables developers to use their existing web development skills in HTML, AJAX, Flash, and Flex to build and deploy rich Internet applications to the desktop.

Adobe Media Player: A desktop media player that brings the best of both the broadcast television and web video worlds to your desktop—providing high-quality content both online and offline, with a wide range of business model possibilities.

Bandwidth: The amount of throughput of a server or a client computer. Usually measured in megabits per second (Mbps) or kilobits per second (Kbps). A typical wired Ethernet connection is 100Mbps, and WiFi is 54Mbps. Server and client bandwidth limits determine how much video can be served or received.

Buffer: The amount of video stored in RAM on the client computer. The larger the buffer, the smoother the video plays back. The buffer is never written to disk.

Content Delivery Network (CDN): A company that offers streaming services and bandwidth so that customers do not need to set up and install servers of their own.

Client: The consumer connecting to Flash Media Server via Flash Player or Adobe AIR applications.

Codec: The format in which a video or audio file is encoded. Flash uses Sorenson Spark, On2 VP6-S, On2 VP6-E, and H.264 codecs for video; Nellymoser, MP3, and AAC for audio. Short for "code/decode," the decoding part of the codec must be present in the player to play back video using a specific codec.

Connection: When a client is streaming video it consumes one connection. When multiple clients are streaming at the same time, they are referred to as simultaneous connections.

Content: Video or audio data streamed from Flash Media Server.

Digital Rights Management (DRM): Video encoded with DRM can be sold and protected against stealing and unauthorized sharing.

Encoder: Software that compresses or transcodes video from one format to another.

Enhanced RTMP: The next-generation Real Time Messaging Protocol (RTMP) that increases security and performance.

Flash Lite 3: The next-generation mobile Flash player that supports the VP6 and Spark codecs and allows for RTMP connections to Flash Media Server.

Flex: A cross-platform, open source framework for creating rich Internet applications that run identically in all major browsers and operating systems.

Flash Media Live Encoder: A free Windows XP-based desktop application that connects to Flash Media Server and allows you to stream live video and audio to Flash Player.

Flash Media Solution Provider program: A partner program that helps promote a strong ecosystem around Flash Video and Flash Media Server.

Flash Video Streaming Service (FVSS): Adobe has partnered with leading CDNs to offer hosted services for delivering on-demand video for Flash Player across high-performance, reliable networks.

Live: Live video streaming using Flash Media Live Encoder or Flash Player.

Publishing point: A directory on Flash Media Server where customers can place video and audio content and publish live video.

On2 VP6: A video codec that offers high-quality, lightweight, full-screen playback (available since Flash Player 8). VP6-S is a simplified version that is ideal for delivery of high-quality video to older computers (available in Flash Player 9 or later). VP6-E, the original codec that shipped with Flash Player 8, offers slightly higher quality and requires more processing power for playback.

Real Time Message Protocol (RTMP): Adobe's proprietary method of communication between Flash Player clients and Flash Media Server.

Quality of Service (QS): Refers to the quality of the consumer's playback experience.

Solution provider: Consulting and enablement organizations that provide advanced knowledge of Flash Media Server and video for Adobe Flash Player and their integration over multiple devices.

Sorenson Spark: Original video codec in Flash Player 6 and 7. An encoder for this codec is also built into Flash Player, allowing for webcam broadcast and archiving when used with Flash Media Server.

Transcoding: The conversion from one video format to another. Usually transcoding allows you to change the codec. Each time a file is transcoded, quality is lost.

Video on demand (VOD): The delivery of prerecorded Flash video streaming.

Online resources

Flash On.™ (Adobe video showcase)
www.adobe.com/flashon

HD video with Adobe Flash
www.adobe.com/products/hdvideo

Adobe HD Gallery
www.adobe.com/products/hdvideo/hdgallery

Understanding the difference between progressive download and streaming video
www.adobe.com/devnet/flash/articles/flv_download.html
www.adobe.com/products/hdvideo/supported_technologies/streaming.html

DRM and digital media protection with Flash Media Server
www.adobe.com/devnet/flashmediaserver/articles/digital_media_protection.html
www.adobe.com/products/hdvideo/supported_technologies/content_protection.html

Performance-tuning Flash Media Server 2 for live webcasts using Linux
www.adobe.com/devnet/flashmediaserver/articles/performance_tuning_webcasts.html

Exploring Flash Player support for high-definition H.264 video and AAC audio
www.adobe.com/devnet/flashplayer/articles/hd_video_flash_player.html

AAC-HE version 2 details
www.adobe.com/products/hdvideo/supported_technologies/heaacv2.html

H.264 details
www.adobe.com/products/hdvideo/supported_technologies/h264.html

Streaming through firewalls and proxies: from the client's perspective
www.adobe.com/devnet/flashcom/articles/firewall_streaming.html

Flash Media Server 3.5
www.adobe.com/go/fms

Flash Media Encoding Server
www.adobe.com/go/fmes

Flash Media Rights Management Server
www.adobe.com/go/fmrms

Flash Media Live Encoder
www.adobe.com/go/fmle

Adobe FVSS partners
www.adobe.com/go/fvss

Flash Media Solution Provider program
www.adobe.com/go/fmsp

Flash Player 9 update FAQ
http://labs.adobe.com/wiki/index.php/Flash_Player:9:Update:H.264

Flash Media Server community

FMSGuru.com
www.fmsguru.com

FlashComGuru
www.flashcomguru.com

FlashConnections
www.flashconnections.com

Flash video optimizations and tools
http://flashvideo.progettosinergia.com/

References

A Streaming Media Primer
www.adobe.com/products/aftereffects/pdfs/AdobeStr.pdf

A Digital Video Primer: Understanding and Using High-Definition Video
www.adobe.com/designcenter/productionstudio/articles/prs1ip_hdprimer/prs1ip_hdprimer.pdf

Video content protection measures enabled by Flash Media Server
www.adobe.com/devnet/flashmediaserver/articles/protecting_video_fms.html

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